AUTOMOTIVE INDUSTRIES

AUTOMOTIVE and AVIATION MANUFACTURING
ENGINEERING • PRODUCTION • MANAGEMENT

DECEMBER 15, 1955

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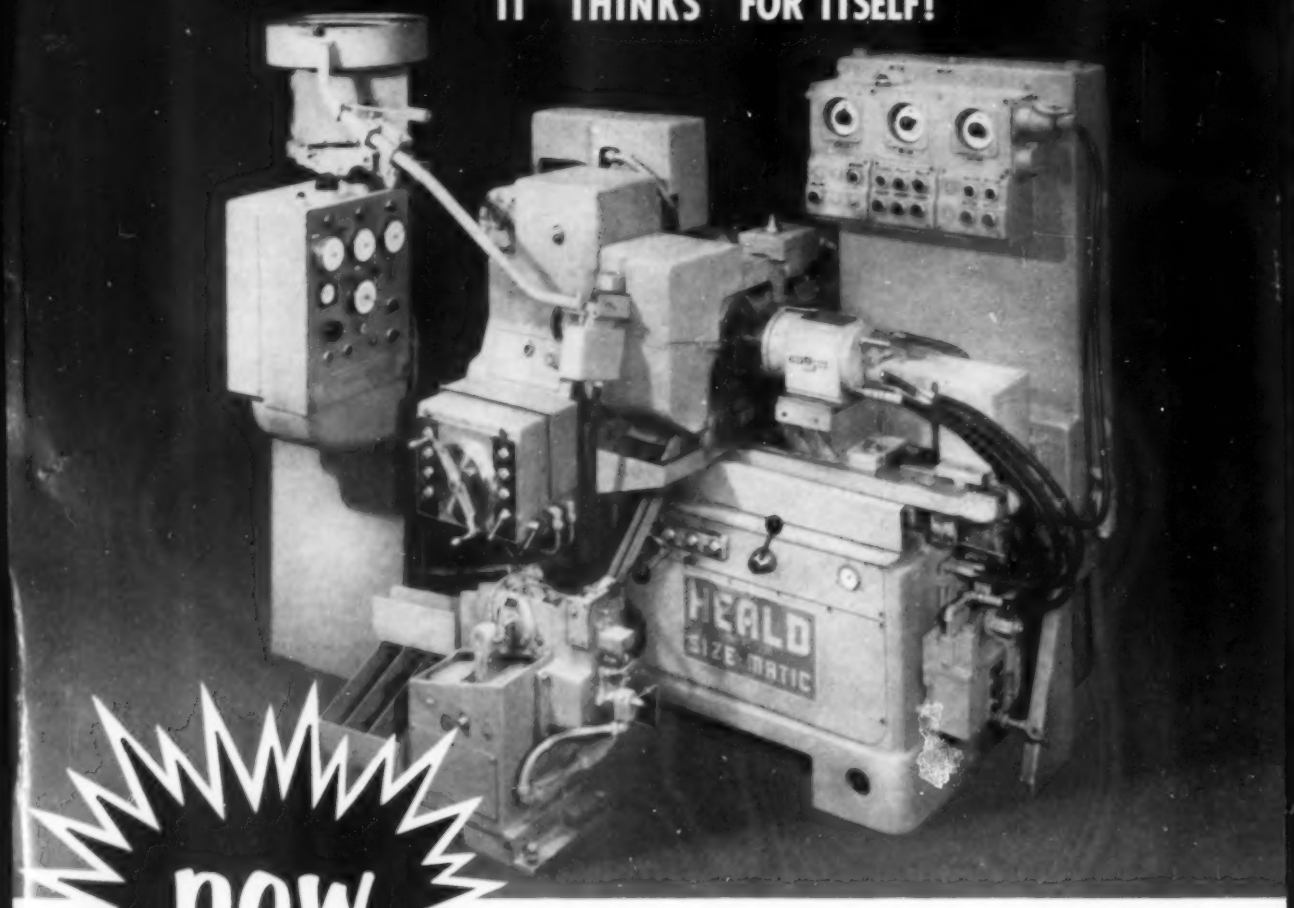
A CHILTON PUBLICATION

IT "THINKS" FOR ITSELF!



new

HEALD MODEL 170 AUTOMATIC CHUCKER

with after-gaging and **FEEDBACK**
holds close size limits automatically

WHAT FEEDBACK MEANS TO YOU

The practical application of feedback to internal grinding and borizing equipment opens a new field for cutting production costs on long-run jobs.

A signal from the after-gaging unit is fed back to the tooling or diamond — automatically correcting any tendency to drift out of size. Feedback limits are well within specified tolerances of the work, thus making any needed corrections *before* parts reach scrap limits.

All this is done without any effort or attention on the part of the operator. That means higher productivity per man-hour — one operator can easily control a greater number of machines. It means that off-size scrap parts are virtually eliminated. It means higher sustained production, with greater accuracy and precision, at *lower cost per part.*

The new, completely automated Heald Model 170 Auto Chucking Size-Matic shown above makes short work of grinding a blind interrupted bore in valve tappet bodies.

With *automatic* hopper feed, orientation, chucking, cycling and unloading, a net production of 204 pieces per hour at 90% efficiency is consistently maintained. And with after-gaging and feedback, tolerances of .0003 on bore size, .00005 maximum out-of-roundness and .0001 maximum taper are easily held. Feedback enables the machine to detect tendencies toward errors—and correct them automatically, without operator attention.

This is Heald automation at work—bringing you higher production and greater precision than ever before. For the newest advances in internal grinding, rotary surface grinding and borizing — IT PAYS TO COME TO HEALD.

For information on the new 170 Size-Matic, send for Bulletin 2-170-V.

THE HEALD MACHINE COMPANY
Subsidiary of The Cincinnati Milling Machine Co.
Worcester 6, Massachusetts
Chicago • Cleveland • Dayton • Detroit • Indianapolis • New York

HEALD

Over the Road... or Off the Highway

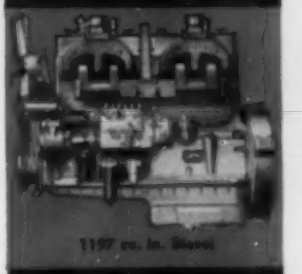
WAUKESHA

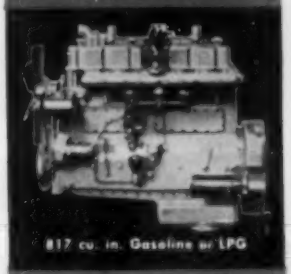
MODEL	Cyl.	*Features	Bore and Stroke	Displ. Cu. In.	Max. Torque @ RPM	Max. HP	RPM
TURBO-SUPERCHARGED DIESELS							
135-DKBS	6	ACTV	4⅛x5	426	400-1800	185	2800
148-DKBS	6	ACTV	5¼x6	779	706-1800	280	2100
WAKDBS	6	ACTV	6¼x6½	1197	1062-1600	352	1800
NORMAL DIESELS							
185-DLC	6	A	3½x3¾	216	152-1200	60	2400
190-DLCA	6	AC	3¾x4	265	191-1400	85	2800
195-DLCA	6	AC	4 x4	302	221-1800	98	2800
135-DKB	6	ACV	4⅛x5	426	328-1600	147	2800
148-DKB	6	ACV	5¼x6	779	584-1000	200	2100
WAKDB	6	ACV	6¼x6½	1197	845-1000	258	1800
GASOLINE							
185-GLB	6	A	3½x3¾	216	176-1400	67	2400
190-GLB	6	A	3¾x4	265	220-1200	77	2400
195-GKA	6	ACV	4⅛x4	320	243-1600	122	3000†
MZA	6	A	4⅛x4¾	404	289-1000	128	2800†
135-GKB	6	ACV	4⅛x5	426	337-1200	147	2800†
135-GZB	6	ACV	4⅜x5	451	354-1200	153	2800†
140-GKB	6	ACV	4½x5½	525	425-1000	177	2600†
140-GZB	6	ACV	4⅝x5½	554	448-1100	188	2600†
145-GKB	6	ACV	5¼x6	779	595-1000	240	2400†
145-GZB	6	ACV	5⅜x6	817	630-1100	250	2400†
WAKB	6	ACV	6¼x6½	1197	1000-1000	280	1800

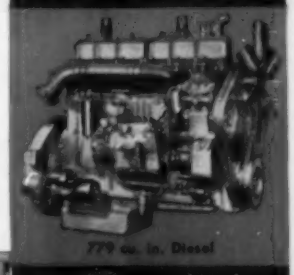
*FEATURES: A—Aluminum Alloy Pistons; C—Counterbalanced Crankshaft; T—Turbo-Supercharged; V—Vibration Dampner.

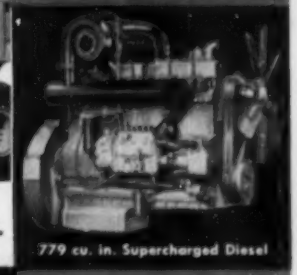
†These engines rated at higher hp and rpm for fire engine service. *Send for Bulletin 1079 for LPG ratings and complete listing of engine hp and speed ratings.*

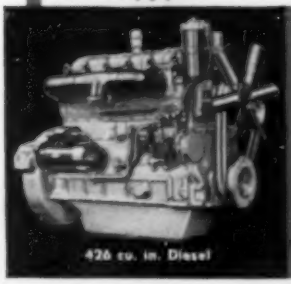
1197 cu. in. Supercharged Diesel


1197 cu. in. Diesel


817 cu. in. Gasoline or LPG

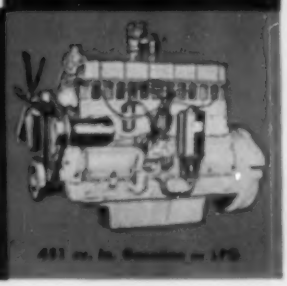

779 cu. in. Diesel


779 cu. in. Supercharged Diesel


426 cu. in. Diesel

426 cu. in. Supercharged Diesel

554 cu. in. Gasoline or LPG


491 cu. in. Gasoline or LPG

50th

280-R

WAUKESHA MOTOR COMPANY • WAUKESHA, WIS.

NEW YORK • TULSA • LOS ANGELES

Inconel makes "pipe dreams" come true

— *in the strangest places!*

Where are we? Looking up at the underbelly of a huge gasoline-powered tractor truck, just in from a long-haul run.

You'll be interested in that exhaust pipe overhead. But don't touch it! *It's red hot.*

Truck operators find most pipes a big source of trouble. When one "blows" on the highway, it means a delayed delivery . . . lost time for the driver...extra expense to the company.

Saving dollars. An ordinary exhaust pipe seldom lasts over 40,000 miles, and usually has to be replaced several times a year. Think what might be saved if a pipe *never* had to be replaced!

A pipe dream? Now it's a reality, thanks to the resourcefulness of a smart maintenance superintendent. Years ago, he started replacing worn-out carbon steel exhaust pipes with new ones made of Inconel®.

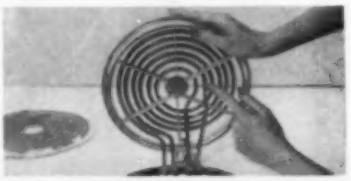
Crowding the million mark. Not a single Inconel pipe has ever been replaced. *Several have already logged almost a million miles each.*

Right now, you may have a metal problem of your own. It doesn't have to resemble this one. Inconel — possibly — is not *your* answer. But remember, there are more than 50 *other* Inco Nickel Alloys available. Find out whether one of them offers the means of transforming a cherished "pipe dream" of *yours* into a reality! Let's talk it over sometime soon.

Q. Where else is Inconel an outstanding success?

A. In jet planes — specifically in *flame tubes*. Here Inconel stubbornly maintains its strength even when white hot.

Q. Where would you be likely to see Inconel?



A. In a kitchen. Inconel sheathing is used on the surface heating units of most electric ranges. Inconel provides quick, even transmission of heat. It resists corrosion. It stands up under use — and abuse.

Q. Where can you find more information on Inconel and half a hundred *other* problem-solving Inco Nickel Alloys?

A. Write for our booklet, *Standard Alloys for Special Problems*. It's free to all who ask for it.

Nickel Alloys Perform Better Longer

INCO TRADE MARK

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67 Wall Street New York 5, N. Y.

AUTOMOTIVE INDUSTRIES

A CHILTON MAGAZINE — PUBLISHED SEMI-MONTHLY

DECEMBER 15, 1955 — VOL. 113, NO. 12

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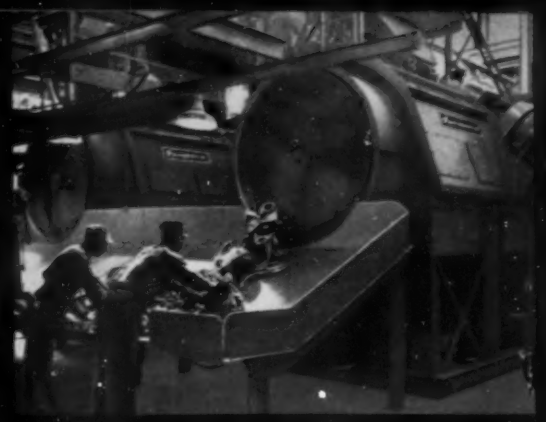
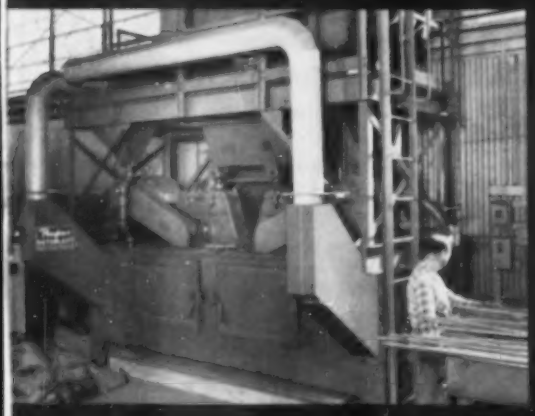
If you have



an unusual blast cleaning problem,



If you are a company with a special cleaning problem, Pangborn offers you a special service—a machine designed for your individual needs. It might be a descaling machine for bars, sheets and coils, a continuous-flow barrel or a monorail cabinet like the machines shown here . . . or it might be completely different. You may need to clean cylinder blocks, bathtubs or any unusual ferrous or nonferrous castings, forgings, stampings. If so, Pangborn engineers will study your problem and its relation to your production line. Then they'll design a Pangborn machine that gives you better cleaning and faster production at lower cost. Pangborn has proved it in hundreds of cases. Pangborn can prove it to you! Write today for Bulletin 1210 to: PANGBORN CORP., 3900 Pangborn Blvd., Hagerstown, Md. *Manufacturers of Blast Cleaning and Dust Control Equipment.*

*U. S. Pat. # 2184926 (other patents pending)

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Special Blast Rooms & Cabinets

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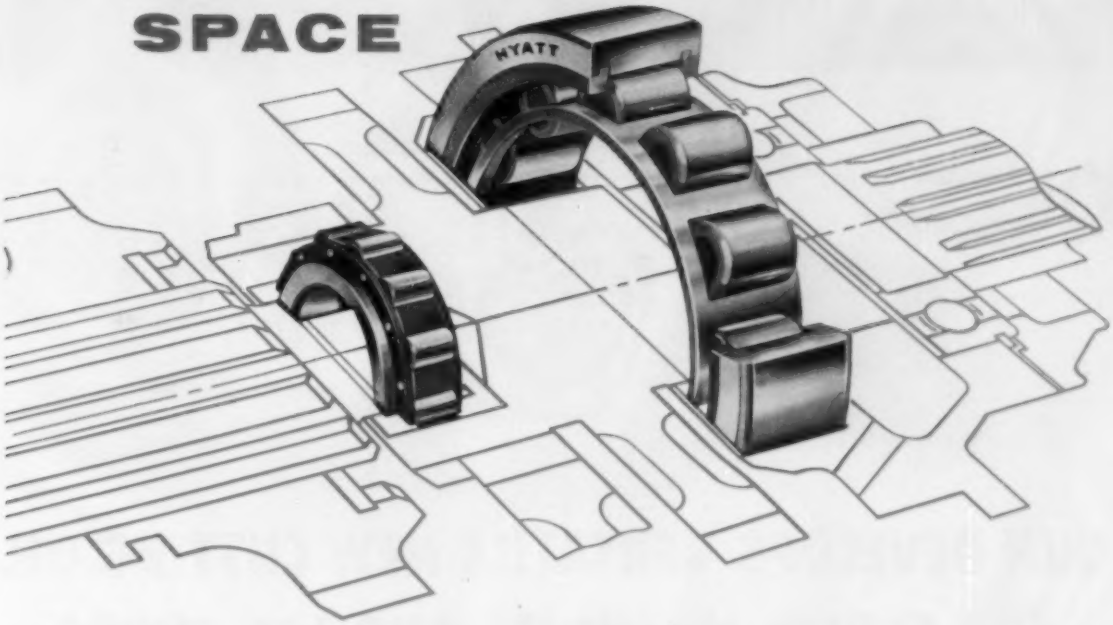
Malleabrasive® Shot & Grit

How Hy-Loads can help you

...SAVE SPACE



HY POTENUSE, the sage of the slide rule, SAYS:

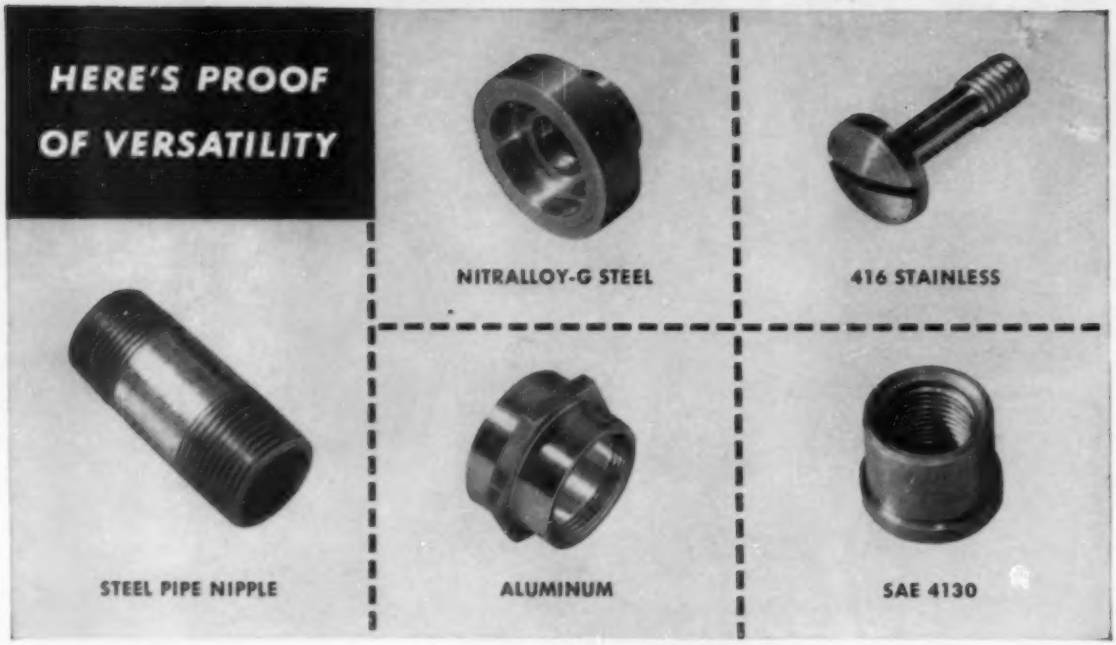
your **COMPLETE LINE** of cylindrical roller bearings

Here's a tractor transmission where the designer's done a mighty fine job of cramming the whole works into a housing with dimensions tighter than McTavish's purse strings!

See how he did it? He used a HYATT BU-type Cylindrical Roller Bearing at the pilot position with the *outer race omitted.* Then on the input shaft he used a HYATT TS-type bearing with the *inner race omitted.* Gear-box size is held to a minimum with maximum bearing capacity! Hyatt makes 4 types of Hy-Loads with separable inner races and 2 types with separable outer races. And brother, they sure come in handy when you're cramped for space! If you haven't a HYATT General Catalog No. 150 handy, better send for yours right now. It'll help you find the answer to lots of pesky problems. Hyatt Bearings Division, General Motors Corporation, Harrison, New Jersey.

HYATT ROLLER BEARINGS

STRAIGHT ○ BARREL ○ TAPER ○



SUN DEVELOPS VERSATILE NEW CUTTING OIL FOR SCREW MACHINES AND JOB SHOPS

New cutting oil, Sunicut 5534, is moderately priced... gives excellent machining results on wide range of steels

New Sunicut 5534 is a non-emulsifying, transparent cutting oil specially compounded to give above-average machining results to operators who want a single oil to machine a large variety of ferrous metals.

Tests have proved that new Sunicut 5534 meets this demand for an all-purpose cutting oil. It is ideal for general screw machine and turret lathe work. It is also excellent for tapping, drilling, threading, and light stamping operations. In addition, new Sunicut 5534 can be used on many special machining jobs, both high and low speed, with metals ranging from B1112 to 4130 as well as free-machining stainless steels.

For complete information about new Sunicut 5534 and how it can help you reduce your oil inventories... lower your production costs... see your Sun representative. Or write SUN OIL COMPANY, Phila. 3, Pa., Dept. AA-12.

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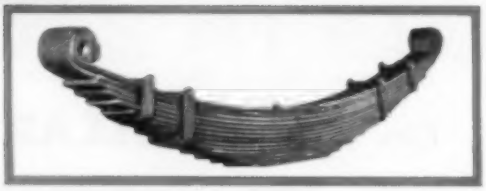

THERE'S something colossal about these great DART trucks . . . rolling their 75 ton loads through rugged mining country . . . enduring the roughest kind of service year after year.

Because of the extreme requirements of this heavy, off-highway equipment, BURTON takes a special pride supplying the springs which contribute vitally to Dart's amazing performance records. No other type of service demands so much or proves so well what BURTON springs can do.

Spring problems solved? Yes . . . and we can solve *yours* too.

BURTON AUTO SPRING CORP.

. . . Vital Support for the Automotive Industry . . .

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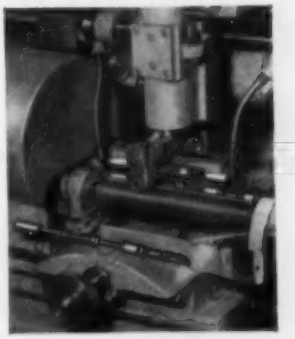
...and GISHOLT SUPERFINISH
breaks another cost barrier!

Do you think of SUPERFINISH as an expensive process? Then it's high time you know the facts.

Here's an excellent case in point... on the record-breaking Douglas "Skyray." Among the most precise parts on this supersonic jet are the slide valves. They're ground from the solid, first on a cylindrical grinder, then on a centerless grinder. Then they're transferred to a Gisholt Superfinisher where the bearing surfaces get a finish of 3 micro-inches, r.m.s. Former time for hand-lapping ran from 2½ to 3 hours per piece. The Gisholt SUPERFINISHER does it in 45 seconds! Think of it: less than 1/200th of the time! And think what that does to costs!

If SUPERFINISH can improve your product, as probably it can, better get the facts. Write today for complete information—ask for booklet, "Superfinishers," Form 1169.



Approximate diam. of slide valves (lower left) is ½" with reduced diam. of ⅛" between collars, or bearing surfaces. Parts are handled on the Gisholt Superfinisher in only 45 seconds per piece.

THE GISHOLT ROUND TABLE

represents the collective experience of specialists in the machining, surface-finishing and balancing of round and partly round parts. Your problems are welcomed here.

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Madison 10, Wisconsin

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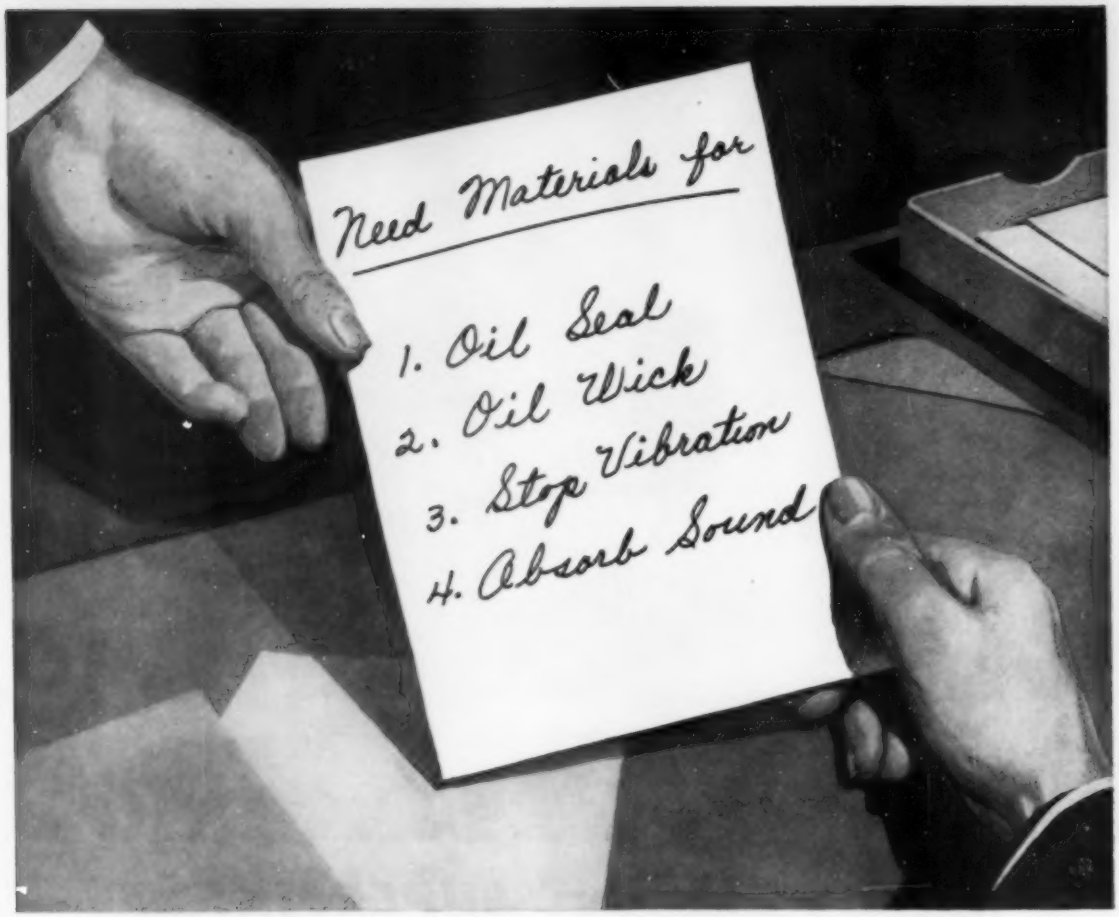

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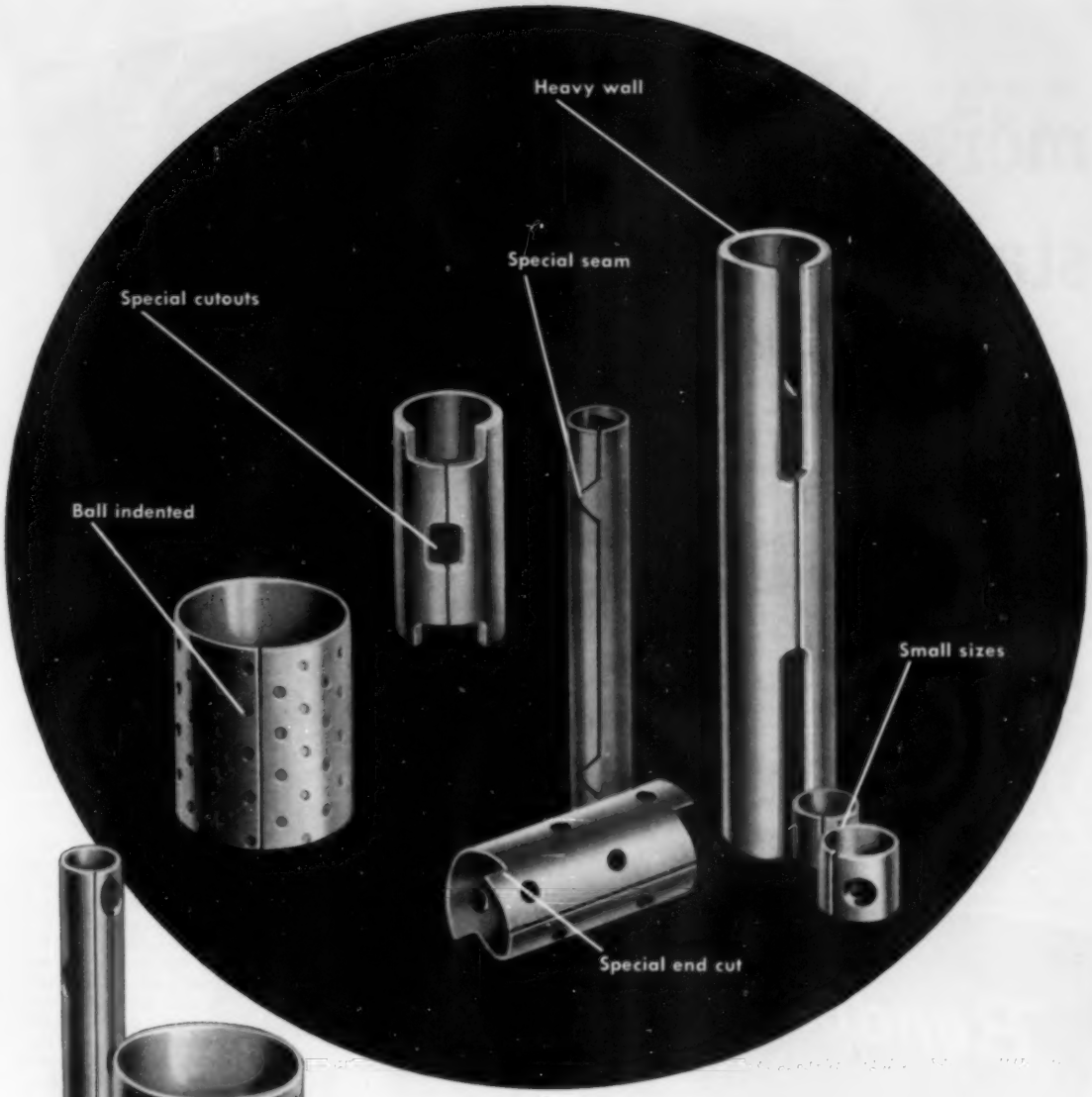

Rolled split spacer tubes are produced in a wide variety of standard and special designs, in many lengths and diameters, of steel, brass and aluminum. They can be ball-indented for oil pockets, or made with oil holes or other special cutouts or seams. FEDERAL-MOGUL DIVISION, Federal-Mogul-Bower Bearings, Inc., Detroit 13, Mich.

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RB&W FASTENER BRIEFS

RUSSELL, BURDSALL & WARD BOLT AND NUT COMPANY

Technical-ities

By John S. Davey

Selecting the right grade of bolt

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There's rarely need for costly alloy steel fasteners—not when 3 physical grades of steel can satisfy most "clamping" applications.

SAE grade 1 offers 55,000 psi minimum tensile strength; grade 2, 68,000 psi; and grade 5, approx. 120,000 psi.

The first is used for fasteners which are stress-relief annealed to increase ductility. The next provides low carbon fasteners with a bright finish. The last goes into high-carbon, heat treated black fasteners identifiable by three radial dashes on the head.

SOME SUGGESTIONS

In terms of holding power, the stronger bolts and cap screws can cost you less than the cheaper bright ones. For example, either a ⅝" with three radial dashes or a ¾" bright cap screw can be used for a safe working load of 20,000 pounds. But being smaller, the high strength one costs less. However, if the same diameter is desirable, then fewer bolt holes need be made and faster assembly achieved when a product is designed to make use of high strength bolts.

In short, for more pounds of clamping effort per dollar, use high strength fasteners; for more pieces per dollar, use the lesser grades.

Cold Punched Nuts add to safety factor

NUTS dilate when tightened on a bolt. They also adjust plastically to distribute the load over many threads. Since nuts are overdesigned to be stronger than the bolt, these stresses can be disregarded for all practical purposes.

How a defect in hex bar caused split in nut machined from it.

Drift punch had to distort cold punched nut severely, far beyond its yield point before it cracked.

There are times, however, when nuts with optimum assurance against service failure are desired. In such cases, it pays to consider use of RB&W cold punched nuts.

These nuts are punched at right angles to the metal's flow lines . . . same direction as stress encountered in service. No unrelieved stresses are set up. The initial punching automatically reveals any defects. Repunching, an RB&W development, then not only trues up the hole for clean, concentric threads, but also serves as a drift punch test, automatically checking the soundness of these safest of nuts.

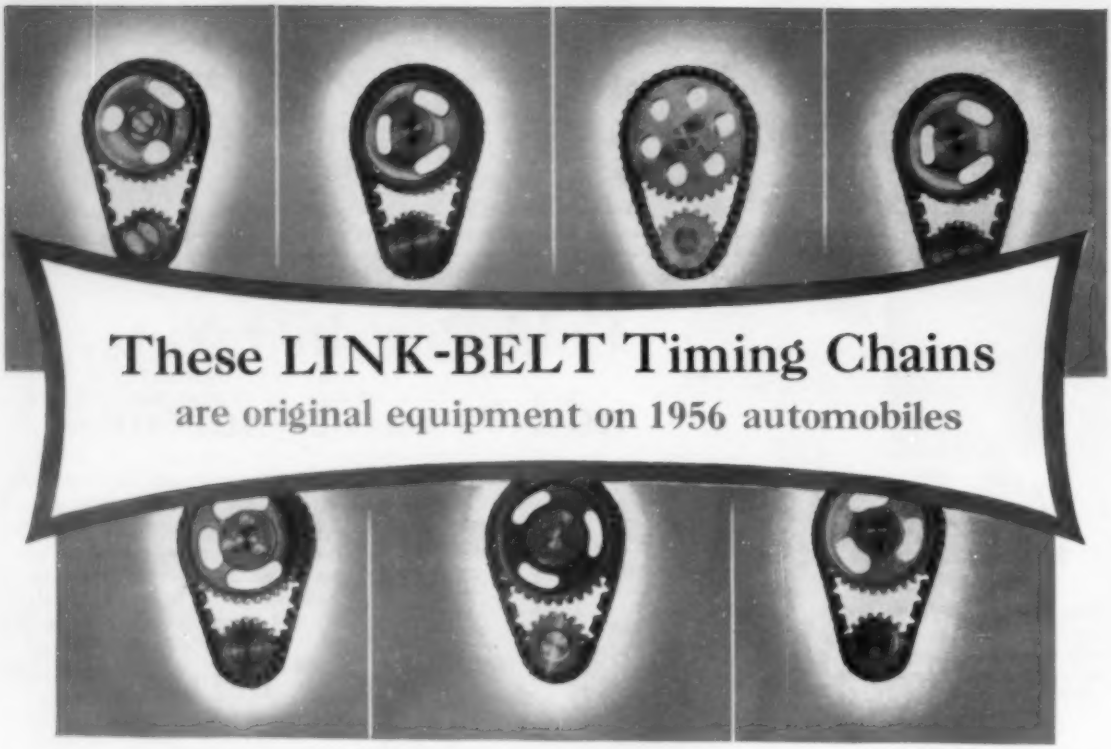
For help in applying standard fasteners to assure more assembly strength and less assembly time, feel free to call in an RB&W man. Russell, Burdsall & Ward Bolt and Nut Company, Port Chester, N.Y.

Plants at: Port Chester, N.Y.; Coraopolis, Pa.; Rock Falls, Ill.; Los Angeles, Calif. Additional offices at: Ardmore, (Phila.), Pa.; Pittsburgh; Detroit; Chicago; Dallas; San Francisco.

One-piece fastener better than two

One particular oil filter used to be fastened with stud and cap sleeve made by screw machine. This was only until RB&W pointed out that a one-piece fastener could be formed easily on a cold header. The advantages gained are obvious. The single fastener *cost* less, and took *less time* to assemble.

RB&W makes a tremendous variety of strong, uniform standard fasteners to improve assembled metal products. If any of these don't fill a particular need, perhaps an RB&W "special" can be developed that will.



These LINK-BELT Timing Chains

are original equipment on 1956 automobiles

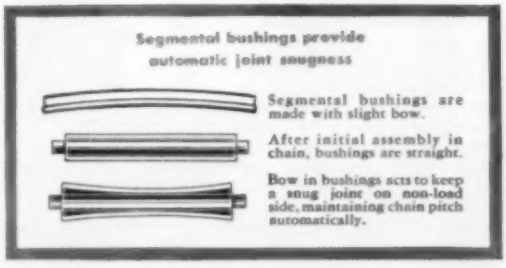
And here's why:

Link-Belt Timing Chain gives you

1 AUTOMATIC JOINT SNUGNESS 2 SMOOTHER OPERATION 3 LONGER LIFE

THE most important difference in today's timing chain designs is illustrated at right. Note how segmental bushings automatically compensate for wear . . . provide for complete joint snugness at all times. In action, Link-Belt gives you anti-whip, anti-back-bend chain—and more miles of quiet operation.

This advanced design is a product of the continuous research and advanced testing facilities in the world's largest chain plant. Let our engineers provide a test drive to your specifications. Or, for full information, get Book 2065.

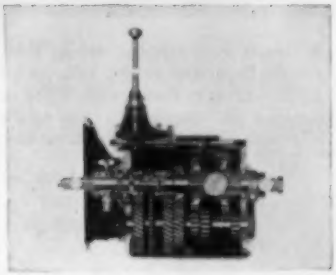

Segmental bushings provide automatic joint snugness
Segmental bushings are made with slight bow.
After initial assembly in chain, bushings are straight.
Bow in bushings acts to keep a snug joint on non-load side, maintaining chain pitch automatically.

LINK-BELT

TIMING CHAINS AND SPROCKETS

LINK-BELT COMPANY, 220 South Belmont, Indianapolis 6, Ind.

YELLOW TRANSIT adds 200 new Fuller Transmissions



Model 5-A-65 Transmission

Yellow Transit Freight Lines, Inc. of Kansas City, Missouri, recently purchased 200 new cab-beside Kenworth Tractors for their 8,435 miles of certified routes through 8 midwestern states.

Powered by 175 hp turbo-supercharged diesel engines, these tractors are equipped with Fuller 5-A-65 heavy-duty 5-speed Transmissions. These Fuller "direct in fifth" Transmissions with constant mesh helical gearing in the top three speeds, were chosen because of their excellent performance for Yellow Transit in the past.

Says William R. Riley, Yellow Transit's Superintendent of Maintenance: "We have used Fuller Transmissions for a number of years. Our satisfactory experience guided us in the selection of these transmissions for the new Kenworths."

Fuller Transmissions let the driver select the ratio he needs at the *right* time to meet every varying condition of time, traffic and terrain. See *your* local truck dealer today. Ask him for the most efficient, easiest-shifting Fuller Transmission to meet your trucking requirements.

Fuller TRANSMISSIONS

FULLER MANUFACTURING COMPANY (Transmission Division), **KALAMAZOO, MICHIGAN**

Unit Drop Forge Div., Milwaukee 1, Wis. • Shuler Axle Co., Louisville, Ky. (Subsidiary) • Sales & Service, All Products, West. Dist. Branch, Oakland 6, Cal. and Southwest Dist. Office, Tulsa 3, Okla.

It almost goes without saying that leakproof Bundyweld can be depended on for reliable performance. It is axiomatic, too, that Bundyweld takes easily to intricate fabrication steps. Above, left, vent tube for use inside gasoline filler tube presented a problem: how to remove possibility of gasoline entering two side vents as gas tank was filled. New design suggested by Bundy completely protects vent from gasoline entry by baffle deflection; requires two fabrication operations: one to flatten end and pierce tube simultaneously, one to put double bend in flattened part.

Skip the trial-and-error process--change to Bundyweld now!

WHY BUNDYWELD IS BETTER TUBING

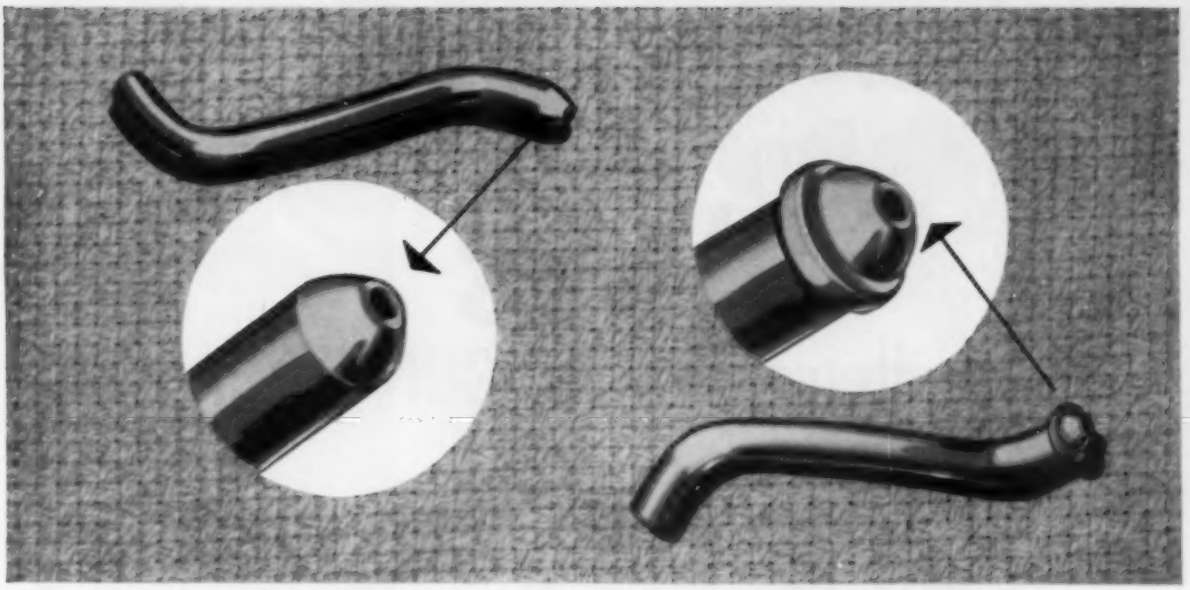
Bundyweld starts as a single strip of copper-coated steel. Then it's . . .

continuously rolled twice around laterally into a tube of uniform thickness, and

passed through a furnace. Copper coating fuses with steel. Result . . .

Bundyweld, double-walled and brazed through 360° of wall contact.

← **NOTE** the exclusive Bundy-developed beveled edges, which afford a smoother joint, absence of bead and less chance for any leakage.



Another example of the ease with which Bundyweld is fabricated: the 3/16" O.D. timing-gear oiler tube shown above required tapered end for a nozzle effect, meant numerous swaging operations. Bundy added upset to nozzle tip (right), incorporated two hand-bending operations into one automatic press operation. Result: impressive fabrication savings.

Maybe you've found a tubing that's somewhat reliable for your automotive brake lines, oil lines, gasoline lines, other tubing needs — *except that it has a mind of its own during fabrication.*

Or perhaps you've dug up a tubing that handles fairly easily — *but you can't count on it for reliable performance.*

You're still looking for the *right* tubing.

We suggest that your search for a reliable, easily fabricated tubing will eventually lead you to Bundyweld. (Reminder: Bundyweld is used in 95% of today's cars in an average of 20 applications each.)

Why not skip the trial-and-error process — wasted time, delivery delays, expensive research, possible damage to your product reputation. Why not measure Bundyweld against your needs *right now.*

Bundyweld is leakproof by test; thinner walled yet stronger; has high thermal conductivity, high bursting strength; takes easily to standard protective coatings; has high fatigue limits. It's the only tubing double-walled from a single metal strip; copper-brazed throughout 360° of double-walled contact.

In addition, Bundy offers you unexcelled fabrication facilities, expert engineering services; custom-packaging of orders; prompt, *on-schedule* deliveries. Whether you fabricate your own parts or want us to do the job, we're equipped to handle your order — *exactly to your satisfaction.*

Why not turn your tubing headaches over to our staff of engineering experts now. They specialize in solving tricky problems, look forward to helping you with yours. Call, write or wire us for information or for help with your problem.

BUNDY TUBING COMPANY, DETROIT, MICHIGAN

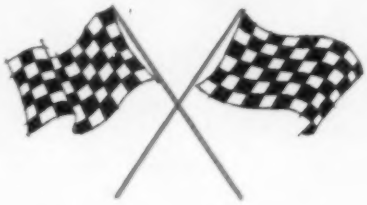
BUNDYWELD TUBING®

DOUBLE-WALLED FROM A SINGLE STRIP

Bundy Tubing Distributors and Representatives: *Cambridge 42, Mass.:* Austin-Hastings Co., Inc., 226 Binney St. • *Chattanooga 2, Tenn.:* Paiman-Deakins Co., 823-824 Chattanooga Bank Bldg. • *Chicago 32, Ill.:* Lapham-Hickey Co., 3333 W. 47th Place • *Elizabeth, New Jersey:* A. B. Murray Co., Inc., Post Office Box 476 • *Los Angeles 58, Calif.:* Tubesales, 5400 Alcoa Ave. • *Philadelphia 3, Penn.:* Ruton & Co., 1717 Sansom St. • *San Francisco 10, Calif.:* Pacific Metals Co., Ltd., 3100 19th St. • *Seattle 4, Wash.:* Eagle Metals Co., 4755 First Ave., South *Toronto 5, Ontario, Canada:* Alloy Metal Sales, Ltd., 181 Pearl St., E. • **Bundyweld nickel and Monel tubing are sold by distributors of nickel and nickel alloys in principal cities.**

The Entire Automotive Industry WINS ... with every MUSKEGON FIRST!

The checkered flags are out—for you and for Muskegon! Five big Muskegon "firsts" in piston ring development have provided the automotive industry with a new concept of ring efficiency, economy, durability and ease of installation on the assembly line. Always in step with horsepower and miles ahead in piston rings, Muskegon design and production leadership will continue to serve engine and transmission builders everywhere—now and in the future!



1st with "Unitized" Steel Oil Rings – Muskegon developed multiple-piece oil rings with component parts bonded together to handle like one-piece rings – making assembly line installation practical. A special adhesive holds ring components together during installation, later disappearing during engine run-in. Easier, faster, error-proof. No special installation equipment necessary.

1st with Chrome Plated "Unitized" Steel Oil Rings – Muskegon, through its unitizing process, made economically possible the adoption of chrome plated oil rings for original equipment use.

1st with Sintered Metal Rings – Muskegon was the first in the development and first to offer them on the market. These stronger, thinner rings make possible new wear and scuff resistance in both sealing and piston rings.

1st with Shaped Steel Segments – Muskegon was first to consider "shape" and light tightness in steel segment design and manufacture. Designed for correct free gap opening . . . permanently shaped and stress relieved.

1st with Lapped Chromium Plated Steel Segments – Muskegon was first to produce and sell lapped chromium plated steel segments. Muskegon realized early that the effectiveness of the chromium plated steel segment for oil control during the run-in and early in the life of the ring set depended on pre-seating and developed production lapping of segments.

Since 1921... The engine builders' source!

DETROIT OFFICE: 521 New Center Building

Telephone: Trinity 2-2113

how leading car, truck and trailer builders solve production riveting problems with Hannifin "HY-POWER" Hydraulics

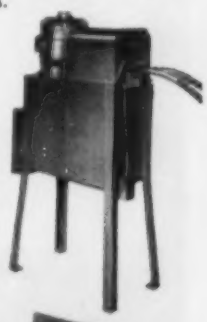
1 They select the correct size "Hy-Power" Hydraulic Cylinders

Hannifin supplies "Hy-Power" Hydraulic Cylinders in 7½ to 100-ton capacities (more in multiple) to exert the force exactly when and where you want it.

2 They mount the cylinders in Hannifin "C"-Frames

The "Hy-Power" line includes standard "C"-frames in a wide variety of sizes and types for portable or stationary use. Or, if your requirements are special, Hannifin will design and build "C"-frames to suit your needs.

3 Power source is the exclusive "Hy-Power" Pressure Generator



Here's Hannifin's patented, noiseless pressure generator. It's a compact unit that combines motor, pump, oil reservoir, control valves and high-pressure intensifier.

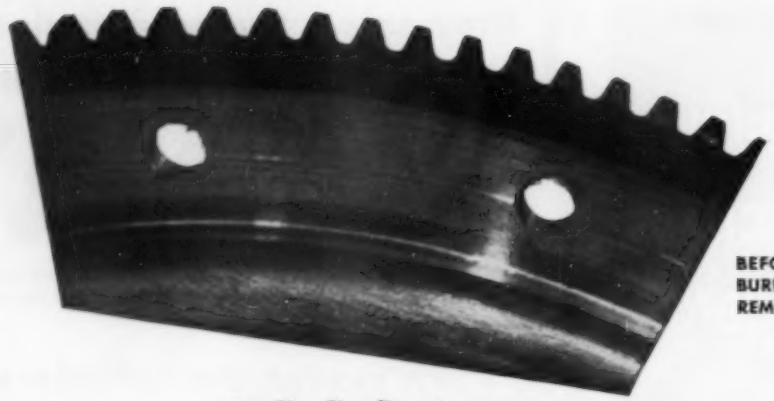
HANNIFIN "HY-POWER" RIVETING IS THE LONG-TIME STANDARD OF THE AUTOMOTIVE INDUSTRY

If you're looking for a better riveting method—whether you need one riveter or fifty—discuss it with your Hannifin representative. Meanwhile, get the full story by writing for Bulletin 150.

HANNIFIN

Hannifin Corporation, 543 S. Wolf Rd., Des Plaines, Ill.

Air and Hydraulic Cylinders • Hydraulic Presses • Pneumatic Presses • "Hy-Power" Hydraulics • Air Control Valves



BEFORE BURR REMOVAL

AFTER BURR REMOVAL

Removing burrs for trouble-free transmissions

One of many automatic brushing setups used by automotive manufacturers to finish transmission parts and other components.

BURRS left on automatic transmission parts can break loose in service, clog hydraulic lines and cause serious damage.

The two sections of a transmission cover shown above prove how thoroughly power brushing removes burrs and blends surface junctures . . . leaves the part smooth and clean.

Have an **O**sborn **B**rushing **A**nalysis made of your operations. It costs you nothing, but may save thousands of dollars in your finishing of parts. Write *The Osborn Manufacturing Company, Department E-36, 5401 Hamilton Avenue, Cleveland 14, Ohio.*

Osborn Brushes

OSBORN

BRUSHING METHODS • POWER, PAINT AND MAINTENANCE BRUSHES
BRUSHING MACHINES • FOUNDRY MOLDING MACHINES

LAPOINTE

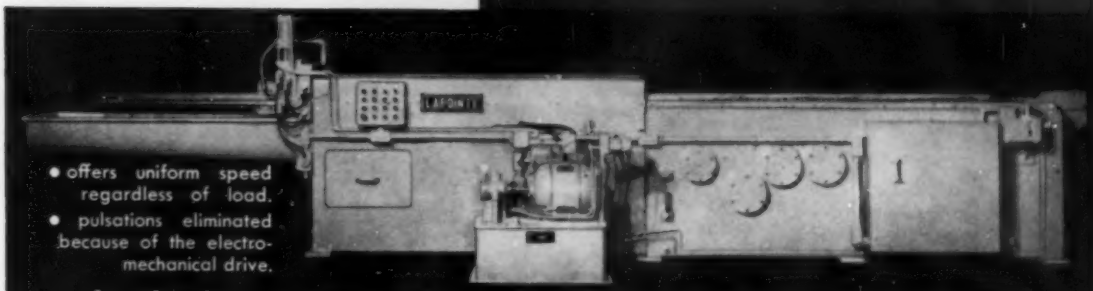
BROADCHING

leads the way,
with a machine for

SPROCKETS and GEARS

...and the same machine can
be adapted to broaching

CIRCULAR SAWS



- offers uniform speed regardless of load.
- pulsations eliminated because of the electro-mechanical drive.

built for amazingly smooth broaching operation!

this new LAPOINTE 60 inch stroke HORIZONTAL

ELECTRIC DRIVE

offers speeds up to

BROACHING MACHINE

300 feet per minute!

With carbide tooling, we can make full use of the production possibilities of this revolutional machine, which operates at three times the speed of any horizontal machine.

CHANGE GEAR FIXTURES
are available for broaching **SPROCKETS**
in a series of ranges from
4" to 20" diameter
18 to 112 tooth sprockets
3/8" to 5/8" pitch
Note: Fixtures and tooling can be provided for larger sprockets and a greater number of teeth.

Send us your inquiries!

this 25 tooth sprocket
is an example of the work that this machine is particularly designed for. Broaching two at a time at 150 feet-per-minute, and holding a tolerance within .002", the net production is
one sprocket per minute

LAPOINTE MACHINE TOOL COMPANY
HUDSON, MASSACHUSETTS • U. S. A.

THE WORLD'S OLDEST AND LARGEST MANUFACTURERS OF BROACHING MACHINES AND BROACHES

- Wheel cover in permanent bright, color, or brushed satin
- Side molding in mirror-bright finish
- Name plate or insignia in gleaming gold
- Fender molding in lustrous brushed aluminum

Your Guide to Aluminum Value

WE CHOSE ALCOA ALUMINUM MILL PRODUCTS

Styling unlimited!

WITH ALCOA ALUMINUM

By the magic of anodized finish, wheel covers of aluminum can be given the gleam of gold, the luster of satin, or brilliant built-in color.

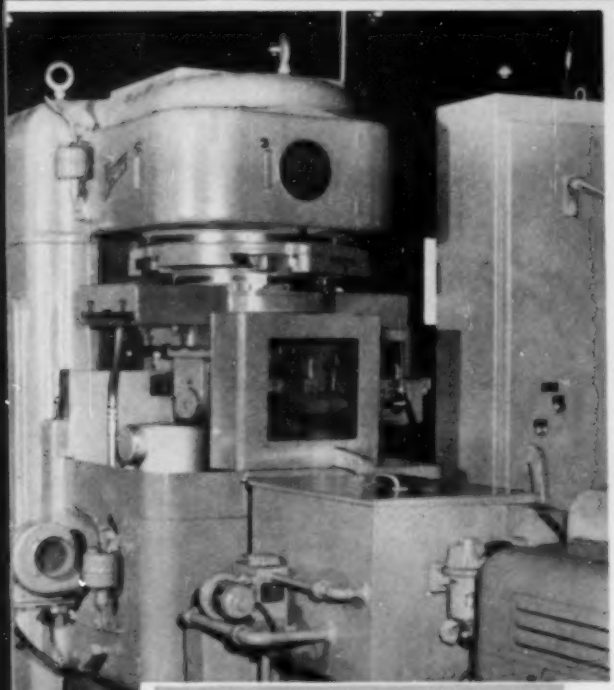
Your scope of design is further broadened by the ease of forming aluminum. This metal of a thousand faces is a *practical* metal, costing less per finished part in many cases than trim of stainless steel or chrome.

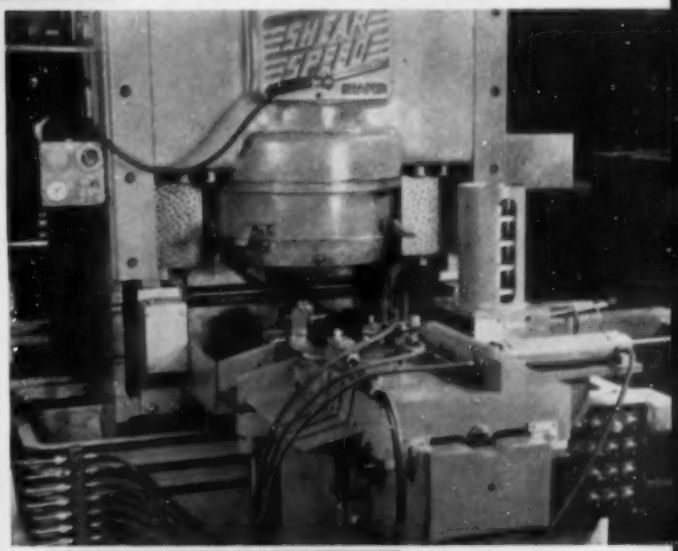
Alcoa does not make automotive trim. We *do* offer you unequaled technical guidance in fabricating and finishing aluminum. To make use of this service, contact the nearest Alcoa sales office. For useful design data, write for our new, free 48-page brochure, *Finishes for Alcoa Aluminum*. Address: Aluminum Company of America, 1841-M Alcoa Building, Pittsburgh 19, Pa.

This Month's

GEAR PIX

NEW LARGER ROTO-FLO spline roller, Model 1551, is capable of cold rolling toothed parts with diameters up to 2 inches. Complete information on this fastest method of forming splines and similar toothed parts is given in Bulletin RF-55.





NEW AUTOMATIC LOADING for Shear-Speed gear shapers, plus automatic size control, offers completely automatic operation on all 1800 series models. Can be specified on new machines or added to Shear-Speeds now in the field.

CONTINUOUS, AUTOMATIC, FAST gear shaving on this Michigan 870-A gear finisher includes automatic size control, hopper feed, washing, and checking for correct size and helix angle. These Michigan gear shavers are used in continuous gear production lines—or in unitized groupings.

MICHIGAN TOOL COMPANY

7171 E. McNICHOLS RD. • DETROIT 12, MICH.

IN CANADA: COLONIAL TOOL CO., LTD.

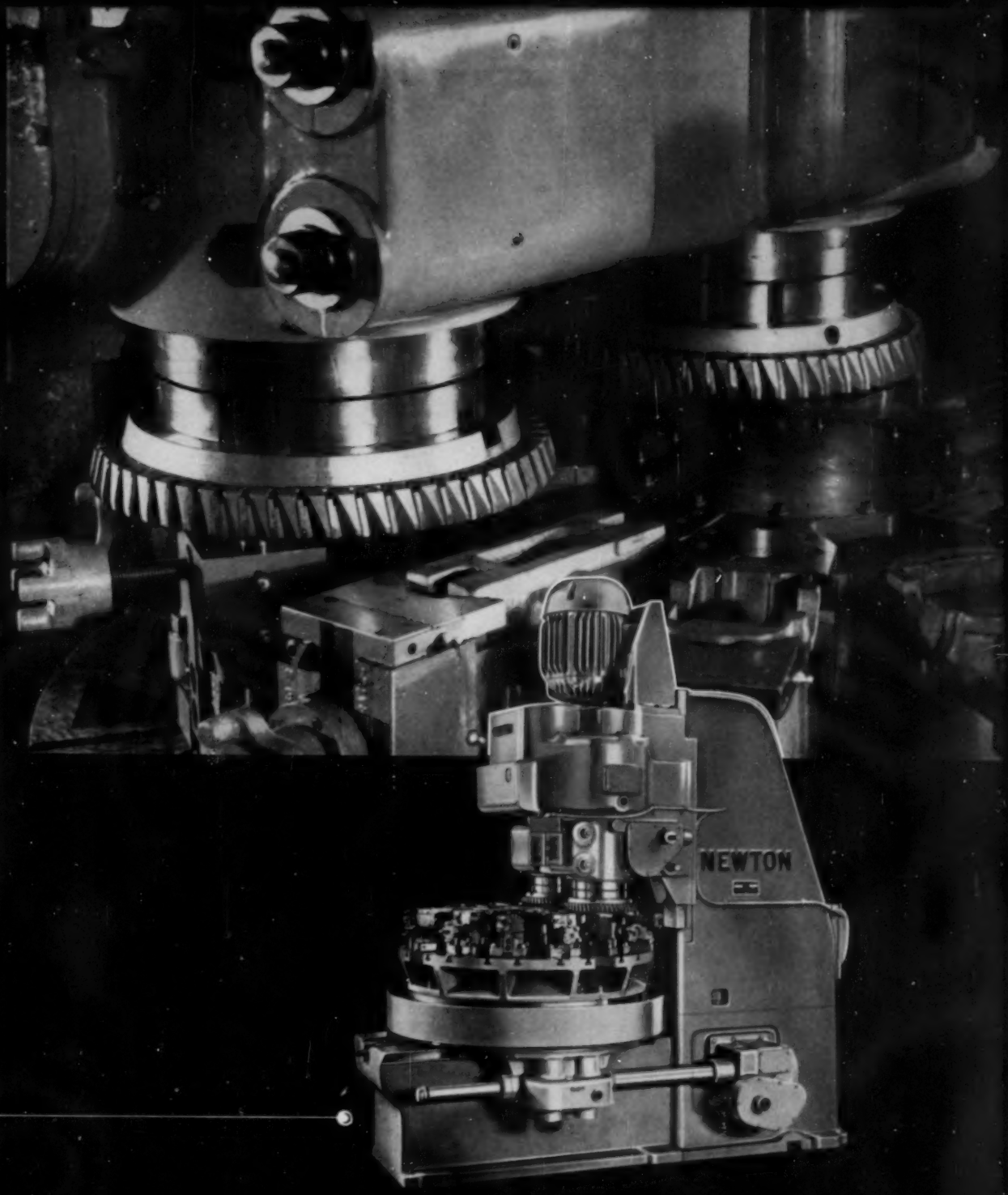
A Method . .

A Newton Vertical Rotary is more than a machine tool—it is a method—the *fastest known method* of milling the flat surfaces of repetitive pieces.

It is fastest because these machines mill continuously!

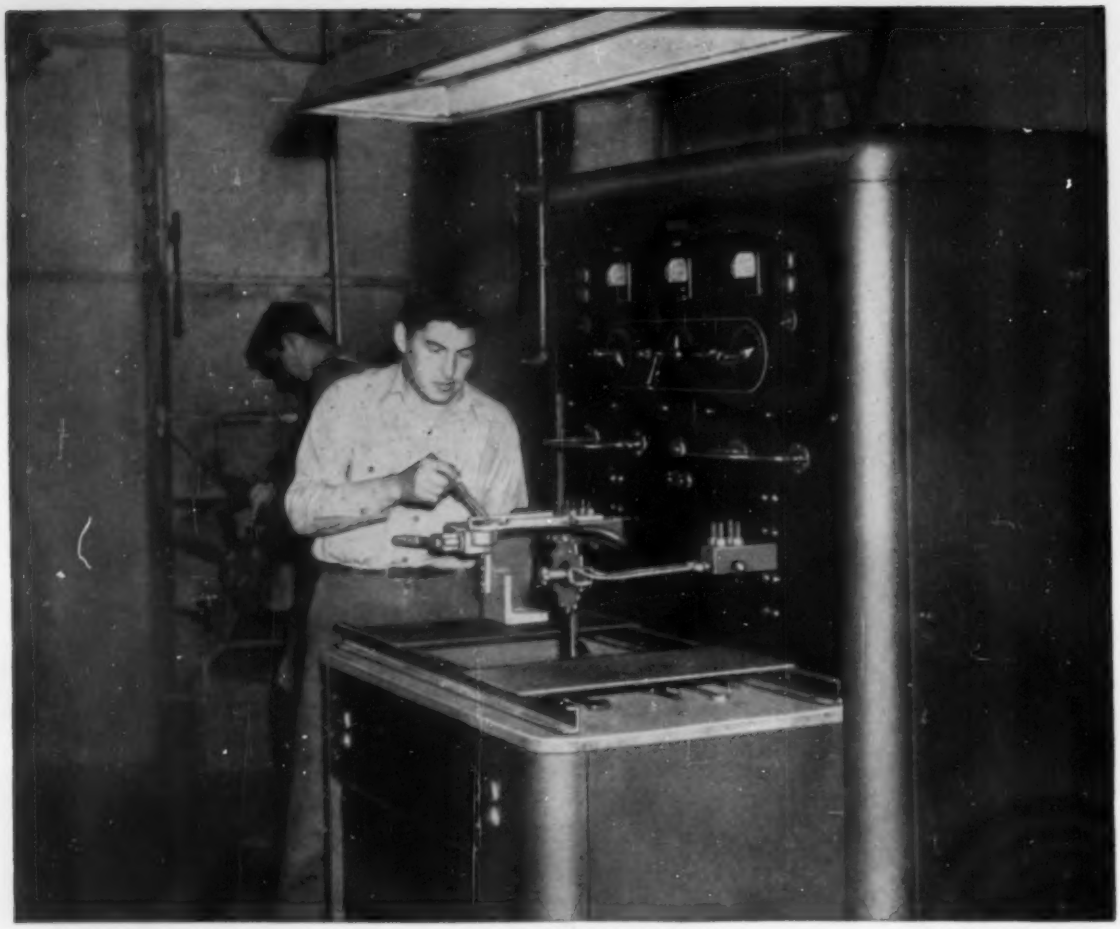
CONSOLIDATED MACHINE

A DIVISION OF FARREL-



TOOL COMPANY ROCHESTER 10. NEW YORK

BIRMINGHAM CO., INC.



LINDBERG INDUCTION UNIT REDUCES BRAZING COSTS BY 50%

It happened in Hawthorne, California, at the Sonnet Tool and Mfg. Co., manufacturers of HELICARB Helical Carbide Cutting Tools. After installing a Lindberg 25 KW induction unit, average brazing time required for a production run of tools was tremendously reduced, resulting in substantial production economies. At the same time, product uniformity was far superior to that achieved by the previous method.

In addition to the obvious dollars and cents savings in time, labor and brazing materials, the Lindberg unit is cleaner and allows more comfortable operating conditions, according to Sonnet.

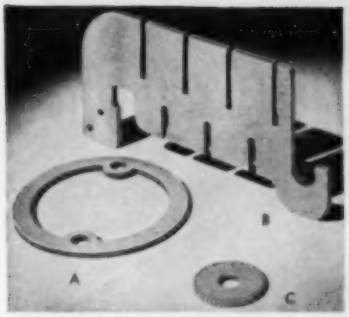
Lindberg engineers will gladly provide you with information on equipment relating to your application. See your nearest Lindberg field representative, or write for bulletin 1441.

Left to right: MERLE HILLIARD, *Vice President and General Manager*; E. C. "BUD" SUNDERMAN, *Shop Superintendent*; PAUL SAXMAN, *Chief Engineer*

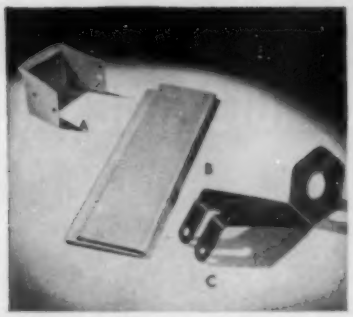
Shop Superintendent, E. C. "Bud" Sunderman says: "One of the wisest investments we ever made was in our Lindberg induction unit. It has opened up new fields of carbide tooling, and has improved manufacturing procedures."

LINDBERG *HIGH FREQUENCY DIVISION*

Lindberg Engineering Company • 2491 West Hubbard St., Chicago 12, Illinois

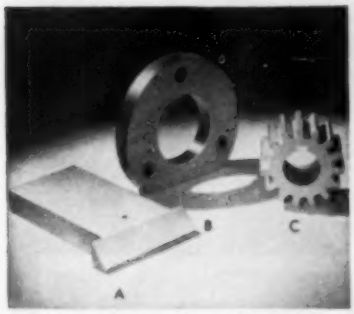


A. Sheet stock, shear strips, punch. B. Sheet stock, shear, punch blank, gang saw notches. C. Sheet stock, shear strips, punch blank, mill notches.

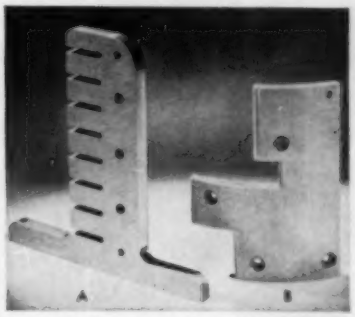


A. Sheet stock, shear strips, punch, form. B. Sheet stock, shear to size, drill, form. C. Sheet stock, shear strips, punch pieces, form in mold twice, rubber stamp twice.

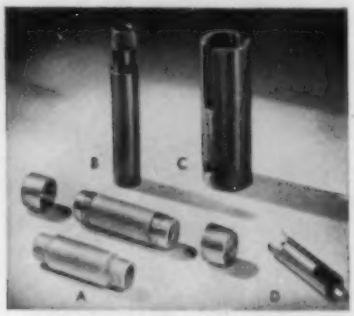
A. Rod (hexagonal), smooth saw, automatic screw machine, turn shoulder thread, chamfer and cut off. Remainder are automatic screw machine parts made from Diamond Fibre by C-D-F.



A. Sheet stock, sand, smooth saw to size, smooth saw bevel, smooth saw corner cut out, drill. B. Sheet stock, band saw, turn OD, bore ID, smooth saw side, drill five blind holes with jig. C. Sheet stock, sand, band saw, rough bore ID, hob teeth, finish bore ID, machine keyway.



A. Sheet stock, sand, smooth saw, drill, smooth saw to shape, radius three corners, gang saw notches. B. Sheet stock, band saw rough blanks, form, smooth saw width, length and shape, radius edges, drill with jig, countersink.



A. Tube, automatic screw machine, turn shoulders, chamfer and thread end, thread other. B. Tube (long pieces), smooth saw, tap threads, screw machine, (small pieces) auto. screw machine, thread, knurl, chamfer, cut off. C. Tube, smooth saw to length, punch twice, countersink. D. Tube, automatic screw machine, chamfer, cut off, punch.

C-D-F fabricates and forms DIAMOND VULCANIZED FIBRE

FAST . . . AT LOW COST . . . DEPENDABLY

Vulcanized Fibre is a wonderful material if you know where to use it and how to buy it. We suggest on many jobs that it's best to do the fabrication and forming in C-D-F's shops. Why? Because C-D-F knows how. Since 1895 the company has put fibre to work in everything from buggy axle bushings to metal clad radio parts. The handling of thousands of set-ups for high speed, low cost production runs gives C-D-F an "experience bank" to draw from. Shop supervisors have a wealth of short cuts, little tricks that result in lower prices for you. They know the material and its peculiarities.

TOUGH, RESILIENT, STRONG

How long has it been since you examined the unique properties and wide range of C-D-F fibre grades? Vulcanized Fibre is arc resistant, mechanically strong, non-corroding, half the weight of aluminum. Repeated moistening and drying in forming insignificantly alters the nature, structure or quality of the fibre.

Since C-D-F has their own paper mill, uniform, quality control is made possible. Special grades are more easily developed. A good example is C-D-F Abrasive Fibre, a medium density fibre with excellent resin and grit adhesion, now widely used for abrasive discs.

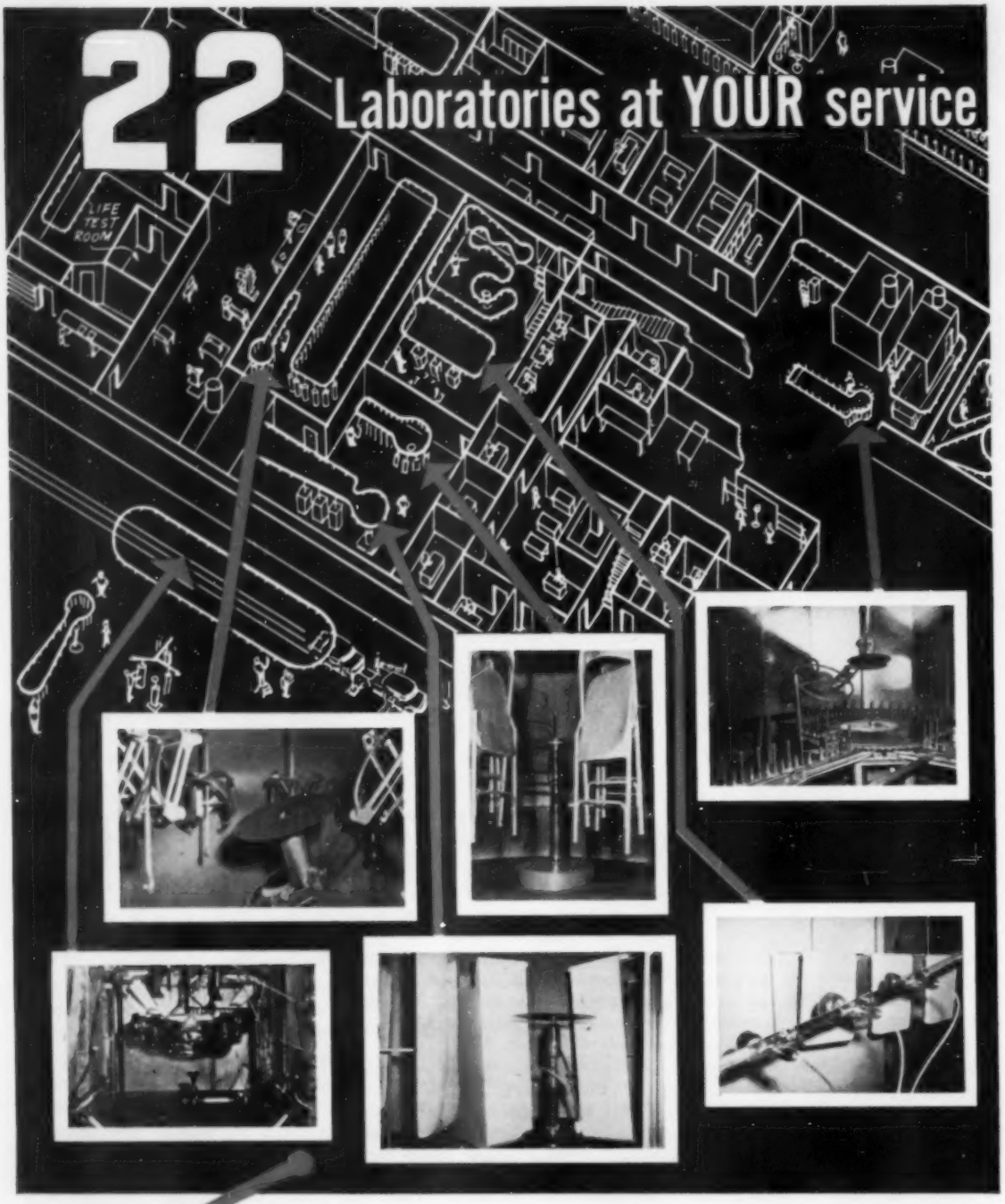
A BIG, RELIABLE SOURCE

C-D-F does business with the largest tonnage users of sheet, rod and tube fibre in the world. This means good deliveries, good prices, reliable products for every new customer. You deal with a materials engineer, a C-D-F man who knows how to give you the most value in Diamond Vulcanized Fibre. If you want to improve design, simplify purchasing, speed production, use Diamond Fibre and the facilities of C-D-F. Write for catalog, free test samples, or send us your print for quotation.

CDF *Continental-Diamond Fibre*

CONTINENTAL-DIAMOND FIBRE DIVISION OF THE BUDD COMPANY, INC.

NEWARK 2, DELAWARE



YOUR JOB, LIKE THESE SHOWN ABOVE, WILL BE TEST PROVEN

under simulated production conditions to determine cost-saving benefits and other advantages. Ransburg also maintains other test facilities in Los Angeles, London, England; Bad Hersfeld, Germany; Paris, France and Sydney, Australia.

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Electrostatic Painting Processes

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High Spots of This Issue

★ ASME Diamond Jubilee Annual Meeting

ASME's meeting held in Chicago last month keynoted the place of the engineer in public as well as technological affairs. Automotive and aircraft topics received much attention in the 300 technical papers presented. Page 48.

★ Chevrolet Foundry Has Newest Automatic Equipment

Automation in the foundry is well represented by the facility established by Chevrolet at Tonawanda, N. Y. Producing cylinder heads, blocks and other parts, a host of new equipment is doing an integrated and efficient job. Page 50.

★ Ford Assembly Plant Has Separate Truck and Car Lines

The huge plant at Mahwah, N. J., is one of Ford's most modern additions for car and truck production. By utilizing vast prior experience, the new facility has the latest materials handling and assembly equipment. Page 60.

★ New Diesel and Gas Turbine Developments

At the recent SAE Diesel Engine and Transportation meetings the designs of several new Diesels and the features of the differential gas turbine were revealed. These interesting developments are described and illustrated. Page 65.

★ Special Assembly Techniques For Unitized Type Bodies

American Motors Corp., with the start of 1956 car production, has introduced an entirely new assembly line for Ramblers at its Kenosha, Wis., plant. The techniques employed are highlighted here. See Page 68.

★ 59 New Product Items And Other High Spots, Such As:

Bodies assembled before painting at Chrysler; SAE fuels and lubricants meeting; Scottish motor show; Russian engineers inspect British automobile plants; gas turbine vibration problems; and engine tester uses huge universal joint.

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AUTOMOTIVE INDUSTRIES COVERS
PASSENGER CARS • TRUCKS • BUSES • AIRCRAFT • TRACTORS • ENGINES • BODIES • TRAILERS • ROAD MACHINERY • FARM MACHINERY • PARTS AND COMPONENTS • ACCESSORIES • PRODUCTION EQUIPMENT • SERVICE EQUIPMENT • MAINTENANCE EQUIPMENT
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News of the AUTOMOTIVE AND AVIATION INDUSTRIES

Vol. 113, No. 12 December 15, 1955

Two Millionth Vehicle Built By Chevrolet

Chevrolet turned out its two millionth vehicle on Nov. 25, about a month ahead of the same number of vehicles it produced last year. It was the second time that the company hit the two million mark in a single year.

Although no other automobile company has matched that figure, Ford came close to it this year in turning out 1,921,816 vehicles on Nov. 25. Ford's total included 1,585,421 cars and 336,395 trucks.

Thompson Gets Orders For Jet Engine Parts

Orders for key parts for the J-79 jet engine made by General Electric Co. have been placed with Thompson Products, Inc. The orders are for complete compressor-rotor assemblies and front-compressor-stator assemblies, vital parts of the engine, which reportedly is being considered by the military.

British Manufacturer Sought For Novel Ferguson Vehicle

According to the latest word received from AI British correspondent David Scott, Harry Ferguson is offering the British motor vehicle industry first option for the manufacture of his newly developed so-called "wonder" car. This vehicle has, of course, been given widespread publicity in both the domestic and foreign press in the last few weeks.

While no agreement with any automobile producer is said to have been reached, a few details of the basic Ferguson design—conceived for commercial and military transport as well as for private cars—have been unofficially disclosed. It should be borne in mind that while the descriptive points presented below come from reliable sources, they have neither been confirmed nor actually denied by the Ferguson organization.

Wheels of the car are said to be driven by individual hydraulic turbines or torque converters fed from a common high-pressure pump. This is powered by a horizontally opposed, flat-four, water-cooled engine which can be mounted at either front or rear. A form of automatic transmission is included for ratio changes; drive can be to two or four wheels.

The same turbines are reportedly used for braking by redirecting the hydraulic fluid to oppose rotation. Thus, there is no conventional clutch, gearbox, differential, or friction brakes; control is by two pedals.

The chassis consists of a central tubular backbone of about six in. diam. All wheels are said to have independent hydraulic suspension. Body is of plastic reinforced with glass fibers.

Excellent traction and even, nonskid braking are claimed to result from the fact that appropriately balanced torque and retarding forces are automatically applied to all wheels. Prototypes tested in Britain are reported to have reached a speed of 90 mph. Cross-country and endurance runs have allegedly been successfully conducted.

MIGHTY BRITISH GYRON JET IS FLIGHT-TESTED

The de Havilland Gyron, thought to be Britain's most powerful jet engine, has now been flight-tested in a Short Sperrin bomber. It is installed in the lower port nacelle. Although the thrust figure has not been disclosed, the power unit is stated to combine a very low specific rate with a rugged and simple structure.

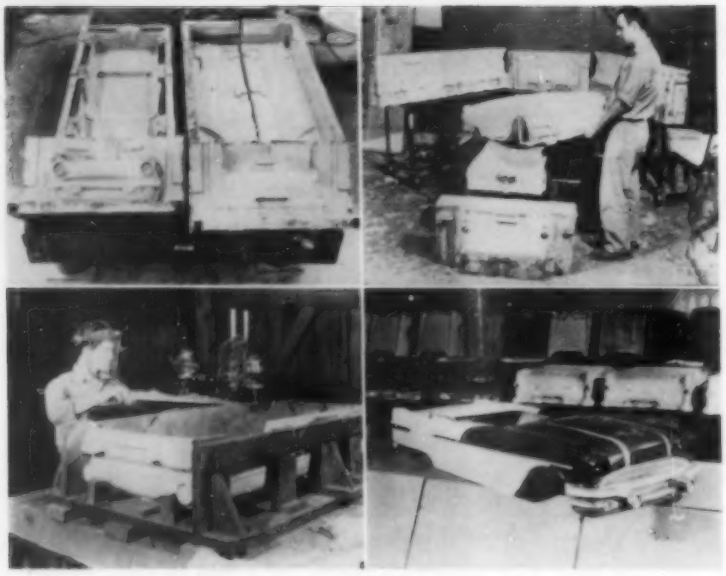
Hupp Acquires Assets Of Pioneer Electric

In line with its diversification program, Hupp Corp. has acquired the business and assets of Pioneer Electric & Research Corp., Chicago, maker of remote control equipment for teletypewriters. Earlier, Hupp made merger agreements with Typhoon Air Conditioning Co. and Typhoon Prop-R-Temp.

General Dynamics and Bristol Cooperate on Aircraft Project

General Dynamics Corp. and Bristol Aeroplane Co., Ltd., England, are working together on a new long-range transport airplane. Proposed plane will be in the 500-mph class, designed around four Bristol BE-25 turboprop engines. The companies intend to produce the aircraft and engines concurrently on both sides of the Atlantic.

News of the AUTOMOTIVE



Steps in production of reinforced plastic bodies for Pontiac Junior Star Chief.

Old Lincoln-Mercury Plant Sold To Detroit Edison Co.

The former Lincoln-Mercury plant in Detroit, which built its last car more than three years ago, has been sold to Detroit Edison Co. Since production halted there the 1.9 million sq ft facility has been idled, and only a portion has been used for Lincoln and Mercury administrative activities.

Mercury will lease the section until the middle of next year. It then expects to move into its new quarters in the Ford administration building in Dearborn.

Perfect Circle, Union Agree on New Contract

Although it won several concessions from the Perfect Circle Corp. in New Castle, Ind., where one of the most violence-ridden strikes erupted, the UAW-CIO suffered another major setback. It failed to get a union shop, its principal objective.

Under the new two-year contract, approved in the latter part of November, the strikers will get a 10-cent-an-hour wage increase, which was granted to non-strikers last July, plus an additional seven cents in July, 1956. The company also agreed to reinstate most of the 35 strikers it discharged.

While the union won a "maintenance of membership" clause in the contract, it will have bargaining rights at only the New Castle plant. The clause provides that once an employe joins the union, he must stay a member for the life of the contract.

S-P Plans Greater Parts Integration On '57 Cars

Studebaker - Packard Corp. plans much greater interchangeability of parts between Packard and Studebaker models on 1957 models. It has not yet had time under its integration program to reach anything like maximum possibilities on interchangeability on the two makes.

Automobile Industry Studying New Types of Oils For Cars

High-priced special automatic transmission oils may be on the way out. The automobile industry is working with oil companies to develop a new type lubricant known as "Type C," a good grade of mineral oil. It is similar in specification to 2104-B which the military has used successfully over a considerable period in both engines and automatic transmissions.

Plastic Molds and Tooling Speed Production of Pontiac Model Car

Plastic molds and tooling are speeding production of reinforced plastic bodies for Pontiac's new child's Junior Star Chief. Scaled down in detail from original engineering drawings for the 1956 Pontiac Star Chief convertible, the one-third size replica is 28 in. wide and slightly more than six ft long, bumper to bumper.

The master mold model is reproduced in Bakelite epoxy resins reinforced with Fiberglas (top left photo) by casting from a clay model. Ten or more sets of duplicate molds are then cast from this master model for actual production line use by the vacuum bag method.

Compounded by Rezolin, Inc., for plastic die, tooling and mold use, Bakelite epoxy resins form both master model and duplicate molds. Five separate sections — front, rear, two sides and top — are clamped in position to form a complete mold.

Into this mold, which is painted with a release agent, Fiberglas mat is laid up in strips and painted with liquid polyester resins. A translucent film bag over this uses the weight of the atmosphere to apply pressure in the mold when air is pumped out from under it.

Heat lamps then harden the resin, and the impact-resistant body shell is removed in one piece by collapsing the mold sections (top right photo). A trimming fixture, with precise locator pads, made of Rezolin tooling compounds, holds the molded body in position to trim rough edges (bottom left photo).

The body shells are then painted in a two-tone style of blue and white with chrome detail (bottom right photo). A standard-size electric starting motor, 12-volt battery, foot brake, gear shift, and other accessories are assembled in the reinforced plastic body shell.

AND AVIATION INDUSTRIES

Smead Sees Bright Future For Automobile Industry

L. W. Smead, general sales manager of Ford Div. of Ford Motor Co., cites some figures to back the automobile industry's predictions that 1956 again will be another good year for car sales. One of them is the estimate that consumer spending will rise next year by $10 billion over this year's $251 billion. Indications also point toward a continued growth in multiple car families, Mr. Smead says.

He further bases his optimism on forecasts that Government spending will increase by $2 billion and that business spending will rise from $56 to $60 billion. By 1960, he observes, U. S. family population will increase by five million to a total of 54 million.

Total disposable income in 1960 will climb to $327 billion, or about 22 per cent higher, than the estimated $268 billion this year, Mr. Smead forecasts. The number of families with incomes above $5,000, the most potential buyers of new cars, is expected to increase by 50 per cent between now and 1960.

Radar Brakes on '57 Cars Deemed Highly Improbable

The spate of publicity about radar brake controls coming on 1957 models is unfounded in solid fact. There definitely is such a system under development but it has some bugs yet to be worked out of it and certainly will not be ready for adoption on next year's models. In addition, such a device probably would require approval of many or perhaps all states, a process which would be time-consuming.

Daimler-Benz Assigned Patent For Vehicle With Jet Nozzles

Daimler-Benz Co. of Germany has been assigned U. S. Patent No. 2,724,450 for a motor vehicle equipped with jet nozzles. A movable pipe is said to carry exhaust gases from each cylinder end in a jet nozzle. By moving a control, the driver can reportedly direct the jets to the rear so that the streams of gases augment the car's speed, or he can direct them sideways when the vehicle is traveling in a curve.

According to inventor Reinhold G. Kamps, the vehicle has a conventional transmission and wheel drive. He claims that a 500-hp engine can produce a maximum thrust of approximately 70 lb with the jet equipment. When queried as to whether there are any present plans to produce such a vehicle, Daimler-Benz factory officials replied in the negative.

REO COE UNIT

The new Reo Super V-63 cab-over-engine truck tractor measures 63 in. from front of bumper to back of cab and can pull a 35-ft square nose trailer with a 45-ft overall limit. The new unit is powered by the Reo Gold Comet 195 and 220-hp V-8 engines. Developing ½ hp per cu in. displacement, the engines are available in gasoline or LPG models.

North American to Assist Spanish Firm in Jet Work

North American Aviation, Inc., has entered a technical assistance agreement with Construcciones Aeronauticas Sociedad Anonima (CASA) of Madrid, Spain. North American will furnish technical advice and help for the repair and overhaul of F-86F Sabre Jets recently turned over to the Spanish Government by the Air Force.

The Spanish concern is the largest automobile and aircraft manufacturer in that country with plants in Seville, Cadiz, and Gatafe. Only the Gatafe shops will handle the assembly and repair work at present.

Hudson Car Prices Hiked From 3.9 to 6.1 Per Cent

Prices on the 1956 line of Hudson cars are up from 3.9 to 6.1 per cent. The company again has reduced the number of models it will offer. There are six models available in the 1956 line, against nine for 1955. Actually, only three different basic body styles, consisting of a two-door hardtop and two different four-door sedans, are offered.

The 1956 prices of the four custom models include power brakes, since they are offered as standard this year. Priced at $39.25, power brakes were available as an optional accessory on all 1955 models. They are still an extra-cost item on the two Super models.

HUDSON PRICES*

	1956	1955
Wasp Six Series		
Super Four-door Sedan	$2,179	$2,096
Hornet Six Series		
Super Four-door Sedan	2,504	2,351
Custom Four-door Sedan	2,737	2,533
Custom Two-door Hardtop	2,846	2,645
Hornet V-8 Series		
Custom Four-door Sedan	2,986	2,770
Custom Two-door Hardtop	3,119	2,892

*Factory list prices, excluding Federal state and local taxes and dealer handling and delivery charges.

News of the AUTOMOTIVE

UNUSUAL FIAT DIESEL-POWERED TRUCK

The six-by-six type truck is not in extensive use in Italy and this Fiat one is almost an exception. Powered by a forward-mounted, four-stroke, six-cylinder Diesel engine, its maximum power output is 180 bhp at 2000 rpm. Load capacity is 13½ tons; total chassis weight, 18,700 lb; and overall length, 298 in.

Fruehauf Trailer Co. Acquires Texas Manufacturing Facilities

The truck-trailer manufacturing facilities of Hobbs Manufacturing Co. in Fort Worth, Tex., have been acquired by Fruehauf Trailer Co. In addition to the plant, the transaction includes machinery and equipment and service branches in five Texas cities.

The Fort Worth facility will be operated as the Fruehauf-Hobbs Div. of Texas. Fruehauf plans to expand the operations in adding a 200,000 sq ft manufacturing plant.

Lincoln Breaks Ground For New Headquarters

Ground has been broken for the new Lincoln Div. plant near Novi, Mich. When completed in mid-1957, the facility will have a capacity of 90,000 cars annually. The combined assembly and office building will cover about 1.5 million sq ft of space.

Railroads Sizing Up Gas Turbine Engines

Some railroads now are pursuing the possibilities of gas turbine engines. Union Pacific Railroad has agreed to buy 45 gas turbine locomotives from General Electric Co. for use in mountainous territory of the Northwest. Biggest advantage of the gas turbine locomotive at present is its ability to pull heavy loads up steep grades without slowing down as much.

Fisher Body Consolidates Operations In New Facility

The last of Fisher Body's administration and engineering operations have been consolidated in the division's new central headquarters at the General Motors Technical Center near Detroit. Located on a 192-acre site in Warren, Mich., the facility provides more than 1.3 million sq ft of space in three separate buildings.

Largest unit is the engineering building, which takes up 837,440 sq ft of space. In addition, there is a 348,804 sq ft shop building and a 127,800 sq ft administration building.

Car Producers Seen Reviving Interest in Stock Car Racing

Automobile makers quietly are lining up active and former race drivers to supervise their stock car racing programs. Some of the well known names already signed up by various companies are: Maurie Rose at Chevrolet; Pete DePaolo at Ford; Lou Moore at Pontiac; Bill Strouppe at Mercury; Bill Holland at Packard; and Dan Eames at Dodge.

1956 Studebaker Prices Up 3.6 to 6 Per cent

Studebaker car prices are up to six per cent higher than comparable 1955 models. Increases range from $75 on one station wagon to $104 on two models in the Champion and Commander series. The smallest increase amounts to about 3.6 per cent.

Following the pattern set by other automobile companies, Studebaker cut the prices of automatic transmissions and air conditioners. These were reduced up to $35 and $100, respectively.

Excluding the four new sports-type "Hawk" models, offered by Studebaker for the first time, 12 models are available for 1956 against 25 in the 1955 editions. Factory list prices on the Hawk series range from $1809 for the six-cylinder Flight Hawk to $2800 for the top model in the line, the 275-horsepower Golden Hawk.

STUDEBAKER PRICES*

Champion Series	1956	1955
Two-door Sedanet	$1,678	$1,580
Two-door Sedan	1,772	1,674
Four-door Sedan	1,819	1,715
Commander Series		
Two-door Sedanet	1,792	1,695
Two-door Sedan	1,886	1,785
Four-door Sedan	1,931	1,827
President Series		
Two-door Sedan	1,989	....
Four-door Sedan	2,033	1,932
Classic four-door	2,268	2,168
Station Wagon Series		
Pelham two-door	2,038	1,952
Parkview two-door	2,144	2,069
Pinehurst two-door	2,306	2,228

* Factory list prices, not including state and local taxes, delivery and handling charges, license and title fees.

Aluminum Die-Cast Engine Block Is Developed by Doehler-Jarvis

The successful development of a six-cylinder aluminum die-cast engine block has been accomplished by Doehler-Jarvis Div. of National Lead Co. The straight-type engine block weighs approximately 50 lb as it comes from the die casting machine and 43 lb when trimmed and is said to represent the largest die casting ever made in aluminum.

The new block has been produced on an experimental basis at a Toledo, O., plant of Doehler-Jarvis on a large

AND AVIATION INDUSTRIES

Six-cylinder, die-cast aluminum engine blocks come down conveyor in a Doehler-Jarvis plant at Toledo, O. Machine in background is producing these blocks on an experimental basis.

die casting machine that can handle dies weighing up to 50 tons. These two developments resulted from a joint project of National Lead Co. and Kaiser Aluminum and Chemical Corp.

The new engine block can be produced at a rate of 30 to 35 pieces per hour on a single machine. At this rate, approximately 1700 lb of molten aluminum are used per hour. All of the 129 holes are cored and cast to size. Development of a V-8 aluminum engine block which will weigh between 70 and 75 lb is underway.

Boeing Airplane Co. Works On Naval Gas Turbine Order

Boeing Airplane Co. has received a Navy order for 80 newest model gas turbine engines. The engines, designated 502-10C, will be used to propel two types of small craft and to power generators. The engine develops 220 maximum continuous horsepower.

GM Announces Dates For 1956 Motorama

General Motors Corp. has set the dates for its 1956 Motorama shows. They are: Jan. 19-24, New York; Feb. 4-12, Miami; March 3-11, Los Angeles; March 24-Apr. 1, San Francisco; Apr. 19-29, Boston. Each division will show an "idea" car and there will be one by the corporation.

AI TABLOID

Eaton Manufacturing Co. has announced a $1.25 million expansion program for its Dynamatic Div. at Kenosha, Wis. Manufacturing floor space will be increased by about 34,500 sq ft to a total of 133,000 sq ft.

* * *

Tung-Sol Electric, Inc., is now constructing a new 150,000 sq ft headlamp plant at Boyertown, Pa.

* * *

Plymouth has announced the availability of dual exhausts as a factory-installed option on cars with Hy-Fire V-8 engines.

* * *

Oldsmobile Div. of General Motors Corp. produced its three millionth car to be equipped with Hydra-Matic Drive during the last week in November.

* * *

Borg-Warner Corp. has entered into an agreement to acquire Primor Products, Inc., Adrian, Mich. The latter is primarily a contract manufacturer of refrigeration units for central air conditioning systems.

* * *

Ford Motor Co. has released a sound film showing the development of the Continental Mark II car from drawing board to production.

* * *

Joseph T. Ryerson & Son, Inc. plans to build a new and larger steel service plant near Charlotte, N. C. . . . Reynolds Metals Co. has broken ground for a $5.5 million aluminum extrusion plant near Richmond, Va.

* * *

Dow Corning Corp. received an award for Chemical Engineering Achievement at a banquet in Philadelphia on Dec. 8. The company was honored for its pioneering work in silicones.

Aluminum Co. of America has announced the development of aluminum dry cell batteries with long shelf life. A variety of applications are being explored.

* * *

North American Aviation, Inc., has established an Autonetics Div. for continuation of its engineering and manufacturing operations in the electromechanical field . . . American Radiator & Standard Sanitary Corp. has formed a new Ross Heat Exchanger Div.

* * *

United States Auto Club is name of the new organization which will succeed the AAA Contest Board as the governing body of racing on Jan. 1. Headquarters will be established in Indianapolis, Ind., shortly.

* * *

National Steel Corp. has announced a $200 million expansion program that will add a million tons annually to its capacity in the next three and a half years.

* * *

AI Detroit Editor Joseph Geschelin has been awarded a recognition certificate for 35 years of SAE membership.

* * *

Jones & Laughlin Steel Corp. will increase its steel making capacity by more than 700,000 tons a year and will expand facilities for rolling sheet steel under a $115 million program. The new expansion complements a $135 million program announced earlier for 1955 and 1956.

* * *

Pratt & Whitney Div. of United Aircraft Corp. plans to enlarge its North Haven, Conn., plant to meet increased jet engine orders. . . . Carborundum Co. expects to spend $1.50 million in the next five years to modernize and expand its Monofrax refractories plant in Falconer, N. Y.

(*Turn to page* 104, *please*)

News of the AUTOMOTIVE

OUTPUT OF 1956 MODELS SPEEDS UP NOVEMBER PACE

1955 Passenger Car Production

As reported direct to Automotive Industries by the car factories

	November 1955	October 1955	November 1954	Eleven Months 1955	Eleven Months 1954
Hudson	4,788	1,305	None	47,398	20,019
Nash	7,727	866	5,517	97,335	63,122
Total—American Motors	12,495	2,171	5,517	144,685	91,141
Chrysler	16,394	14,990	12,294	161,975	84,056
De Soto	12,676	11,334	9,197	116,788	86,016
Dodge	29,471	28,283	24,877	286,962	119,011
Plymouth	75,000	60,967	49,794	674,960	327,003
Total—Chrysler Motors	133,541	114,574	96,962	1,241,386	666,089
Ford	163,245	162,597	115,960	1,611,216	1,246,196
Lincoln	4,545	3,048	2,227	35,789	33,217
Mercury	42,637	42,996	10,116	404,461	231,127
Continental	255		None	695	None
Total—Ford Motors	210,682	208,430	128,085	2,052,361	1,510,543
Buick	63,141	10,976	46,485	711,771	477,175
Cadillac	14,799	9,991	11,098	138,499	100,092
Chevrolet	181,515	85,170	131,615	1,672,190	1,257,792
Oldsmobile	61,240	24,757	36,957	369,062	390,758
Pontiac	56,644	47,461	36,835	841,228	322,370
Total—General Motors	377,339	186,345	263,000	3,652,749	2,957,187
Packard	5,992	4,426	232	63,926	25,483
Studebaker	8,488	513	13,297	98,407	79,308
Total—S P Corp.	14,480	4,939	13,529	162,333	104,791
Kaiser	None	None	None	1,002	5,099
Willys	None	None	521	5,877	10,121
Total—Willys Motors	None	None	521	6,879	15,220
Total—All Makes	748,547	517,458	506,694	7,260,111	4,886,971

Ford Cuts Lowest Price Line By $12 to Match Chevrolet

Ford has pruned prices on its lowest-cost "Mainline" models by about $12 to meet competition from Chevrolet's "150" line. Both Ford and Chevrolet now put chrome moldings around rear windows and windshield and on side ornamentation in these lowest priced models.

$19.3 Million Loss Shown By S-P For Third Quarter

Studebaker-Packard Corp., which reduced its losses slightly in the second quarter of this year for the first time, had a net loss of $19.3 million in the third quarter, ended Sept. 30. It brings to more than $28 million S-P's loss for the first nine months of the year.

Sales dropped drastically in the quarter in totaling $72 million, against $126 million in the second quarter and $152 million in the first three months. The third quarter loss was more than double that of the first and second quarters combined, when they totaled $5.6 million and $3.9 million, respectively.

New Effort Being Expended To Lick Mechanic Shortage

The automobile industry has taken another step in its continuous efforts to aid in alleviating the problem of mechanic shortage and training. In cooperation with the American Vocational Association, the Automobile Manufacturers Association has announced a program for training automotive mechanics and for up-grading the profession.

A new book called "Standards For Automotive Service Instruction In Schools" is being distributed throughout schools in the country. The book contains information ranging from selecting and counseling students to shop layouts and the training of teachers.

Automobile Credit Financing Considered in Healthy State

Contradicting much of the concern voiced by automobile dealers, Government officials and some business analysts, heads of several leading finance companies in a recent press conference at Chicago stated that portfolios held by their members are in excellent shape. They conceded that earlier this year there had been a tendency toward some unsound financing which has been corrected.

Representatives at the American Finance Conference meeting reported that, despite all the talk about abnormally low down payments and 36 month contracts, the number of such deals has been very low. They estimated that not more than 10 per cent of the outstanding automobile credit paper is in 30-month or more notes.

The national average new car loan terms, according to their estimates, would be 30 to 35 per cent down and 28 to 29 months on the balance. Used car paper is averaging 35 per cent down and 24 months, they said.

Repossessions currently were said to be low with some companies reporting delinquencies down 35 to 40 per cent below a year ago. They are now running at a rate of about 3½ to four per cent based on units financed.

Finance men look for the trend toward installment purchases of new automobiles to continue its steady upward climb begun in 1947. That year it was 47 per cent, rising to 62 per cent in 1954, and to an estimated 64 to 65 per cent this year. They predict that in 1956 from 65 to 66 2/3 per cent of all new cars sold will be on installment plans.

Plymouth To Launch Exclusive Dealer Plan Beginning of '56

Plymouth will kick off its exclusive dealer program in Kansas City about the first of the year. Three other cities also will be selected for the separation program which will be carried out slowly at first in order to work out the best methods for making the transition with the least disruption to existing dealers.

AND AVIATION INDUSTRIES

Three U.S. Engineers Leave To View Russian Automation

Returning a recent visit to the U. S. by two Soviet automation specialists, a trio of American engineers left Dec. 4 for Russia to tour various Soviet manufacturing plants and research institutes with an eye to seeing what the Russians have done in the development of automation techniques. The U. S. group comprises: Nevin L. Bean, Automatic Transmission Div. of Ford Motor Co.; Dr. Weldon H. Brandt, engineering manager of Westinghouse Electric Corp.; and Dr. Albert C. Hall, general manager of research, Bendix Aviation Corp.

The mission of approximately two weeks' duration is being undertaken in behalf of the State Dept. The American Society of Mechanical Engineers, official host for the Russians when they were here, cooperated in making the arrangements for the reciprocal visit.

Packard-Clipper Forms Fleet Sales Department

Packard-Clipper Div. will push its fleet business more extensively in the luxury car field, which it feels it has neglected. It has already established a Fleet Sales Department, and plans are underway for more intensive merchandising programs aimed at such potential markets as industrial organizations, for-hire limousine operators, state highway patrols and turnpike authorities. The division estimates that fleet purchases will account for about three per cent of its total 1956 model sales.

GM Hits New Colorado Ruling Affecting Dealer Contracts

General Motors' court attack on Colorado's newly amended car dealers license law is significant to both manufacturers and dealers. Its outcome will undoubtedly influence other states which now have, or are contemplating, laws which regulate manufacturers' relations with dealers.

GM is attacking in particular the amendments which provide that manufacturers must honor contracts with dealers after they expire unless they can prove just provocation for cancellation in the courts. GM charges the legislation invaded the historic "separation of powers" principle when it specified that State and Federal Courts must issue an injunction against the manufacturer's attempt to cancel or fail to renew a dealer's contract.

The law also prevents car and parts manufacturers from assessing local dealers for advertising costs or coercing them into buying unordered cars containing more accessories than those advertised as included in list price.

DODGE TRUCK CAB FOR SQUARE-NOSE TRAILER UNITS

Dodge Truck is offering as special equipment a new contoured cab which provides a dimension of only 96 in. from the front bumper to the center of the back of the cab. Designed to permit the use of longer trailers while keeping within legal length limits, it will be available as special equipment on a wide range of the new C-3 Series of Dodge conventional tractors. In order to achieve the 96-in. dimension, the back of the special cab is indented six in. at the center and tapers out to the standard cab depth at the corners, in accordance with necessary requirements.

More Powerful Corvette To Be Introduced Soon

Not much has been heard about Chevrolet's Corvette lately, but it is expected to be back in the picture soon. A new 1956 model with completely new styling and considerably more power is on the way. It will retain the reinforced plastic body.

Nash Ambassador, Statesman Prices Up 5.5 to 6.5 Per Cent

American Motors Corp. has disclosed that prices of the 1956 Nash Statesman and Ambassador cars have been increased in price between 5.5 and 6.5 per cent over similarly equipped 1955 models. Nash is offering five models for 1956 against eight last year.

NASH PRICES*

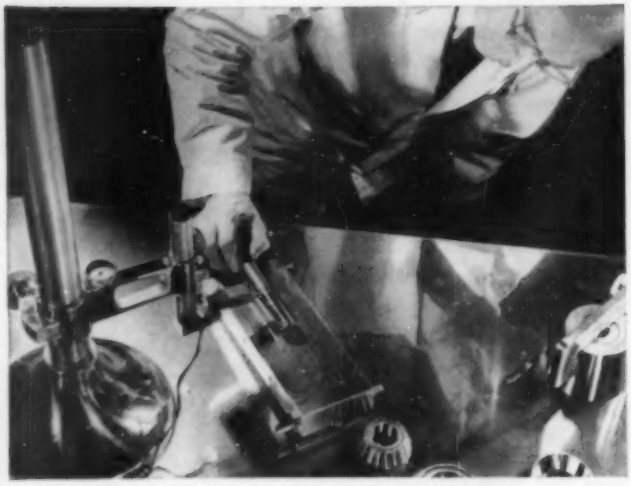
	1956	1955
Statesman Series		
Super Four-door Sedan (six-cylinder)	$2,146	$2,025
Ambassador Series		
Super Four-door Sedan (six-cylinder)	2,425	2,271
Super Four-door Sedan (eight-cylinder)	2,716	2,547
Custom Four-door Sedan (eight-cylinder)	2,939	2,734
Custom Country Club hardtop (eight-cylinder)	3,072	2,846

*Factory list prices, excluding taxes and charges.

Continued on Page 100

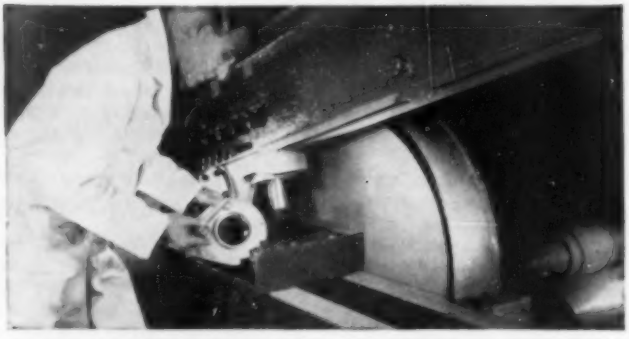
What else does the number tell you?

THE NUMBER LM67010 ON THIS BEARING CUP coupled with LM67048 on the cone tells you it's a certain size tapered roller bearing commonly used on front wheels. But with the trade-mark "TIMKEN" also stamped on the bearing, the number tells you a great deal more—about the quality that's built into the bearing and the service that goes with it . . . tells you the bearing was made by the originator of its new design.



SO ACCURATE that gage blocks stick to the plate. Flat to within 0.00007 inch, this 36" x 60" surface plate is one of the scientific devices used in our tool inspection laboratory to keep our gages accurate—the indispensable must for super-quality Timken tapered roller bearings.

TAILOR-MADE FOR BEARINGS—To be sure of getting steel to meet our exacting requirements we make our own. This piercing mill turns out high quality seamless tubes for bearing cones and cups. It uses the special "elongator" process, developed by the Timken Company, to give closer size tolerances than conventional mills.



CONSTANT IMPROVEMENT—resulting from never-ending research and development. This machine studies the effects of vibration on bearings. It's part of our program to make bearings last even longer. So when you specify a bearing number, specify "Timken" too. And for *full* value always use a Timken bearing cone with a Timken bearing cup. The Timken Roller Bearing Company, Canton 6, Ohio.

***TIMKEN** is number 1 for VALUE where value counts most . . . in the vital zone*

TRADE MARK REG. U.S. PAT. OFF.

NOT JUST A BALL ○ NOT JUST A ROLLER ⊂ THE TIMKEN TAPERED ROLLER ⊂ BEARING TAKES RADIAL AND THRUST LOADS OR ANY COMBINATION

Men in the News

Henry Disston Div., H. K. Porter Co., Inc. —Lawrence L. Garber has been named general manager.

Kearney & Trecker Corp.—**Andrew K. Wilson** has been named vice-presi- of industrial relations, and **Morris L. Hutchens** has been made chief engineer.

Brush Electronics Co.—**William H. Gilman** has been promoted to general employee relations manager.

Houdaille Industries, Inc.—**Russell B. McNeill** has been elected vice-president of administration.

Minnesota Rubber & Gasket Co.—**George E. Carlson** has been elected president.

Lunn Laminates, Inc.—**Carl Halpin** is now a sales engineering representative.

Niagara Machine & Tool Works—**Franklin A. Reed** has been elected vice-president in charge of sales, and **Edwin A. Munschauer, Jr.,** has been made treasurer and a director.

Chrysler Div., Chrysler Corp.—**Frederick A. Wunderlich** is now general operating manager for manufacturing.

Borg-Warner Corp., Ingersoll Products Div.—**M. R. McLary** has been elected vice-president.

Ekstrom, Carlson & Co.—**Ray C. Reinhartsen** has been made general sales manager.

Sun Electric Corp.—**R. R. Malik** has been named president.

Walker Manufacturing Co.—**Wayne Rapp** is now sales manager, and **Robert E. Archer** has become field sales manager of the Wholesale Div. **J. W. Jaspersen** was made sales manager of the Original Equipment Div.

General Electric Co., Aircraft Gas Turbine Div.—**Louis B. Zambon** has been appointed manager of engineering for the Jet Engine Dept.

Chandeysson Electric Co.—**Harold J. Coleman** was named sales manager.

Niagara Machine & Tool Works—George E. Munschauer has become chairman of the board, and Frederick E. Munschauer, Jr., was elected president.

Madison Industries, Inc.—**Willard F. Bierman** was chosen manager of sales and engineering.

Dodge Div., Chrysler Corp.—**H. E. Needels** is now manager of administrative services.

Benchmaster Mfg. Co.—**Edward G. Merk** has been promoted to vice-president in charge of sales.

Crucible Steel Co. of America—**James D. Glenn** and **Maurice J. Day** have been elected vice-presidents of sales and research and development, respectively.

Pennsylvania Salt Mfg. Co.—**Lee H. Clark** has been named vice-president.

Michigan Abrasive Co.—**C. H. Wills** has been made a vice-president, and **W. S. Hoskin** has been named general sales manager.

Link-Belt Co.—**William H. Depperman** has been appointed director of public relations.

Temco Aircraft Corp.—**Charles C. Convers** and **Ed F. Janesic** were promoted to senior contracts administrators, and **Richard P. Kimball** was made chief inspector over major assemblies and flight operations.

Yale & Towne Manufacturing Co.—John A. Baldinger and Roy L. Wolter have been appointed general managers of the Yale Materials Handling and Automatic Transportation Co. Divs., respectively, in recent organizational shifts.

National Automatic Tool Co.—Fred S. Haas has been named director of product engineering.

Joseph R. Ryerson & Son, Inc.—**Homer E. Rieker** has been named manager of sales, and **William B. Hawk** succeeds him as manager of sales of tubular products and cold finished steel bars at the Cleveland Steel service plant.

(*Turn to page* 104, *please*)

Necrology

Glenn L. Martin, 69, pioneer flyer and airplane builder, died Dec. 4, at Baltimore, Md.

Gordon M. Mather, 87, founder and chairman of the board of Mather Spring Co., died Nov. 16, at Perrysburg, O.

Matthew P. Graham, 64, vice-president of Thompson Products, Inc., died Nov. 21, at Detroit.

George Gorton, Sr., 90, president of Gorton Machine Co., died Nov. 22, at Racine, Wis.

Herbert B. Pierce, 68, retired vice-president of International General Electric Co., died recently, at New York, N. Y.

Karl M. Lyons, 66, director of sales for the Container Div. of Jones & Laughlin Steel Corp., died recently, at San Francisco, Calif.

George A. Baker, 83, vice-president of Cockshutt Farm Equipment Co., died Nov. 21, at Toronto, Canada.

Norman Nash, 49, former vice-president of Kudner Agency, died Nov. 16, at Water Isle, Virgin Islands.

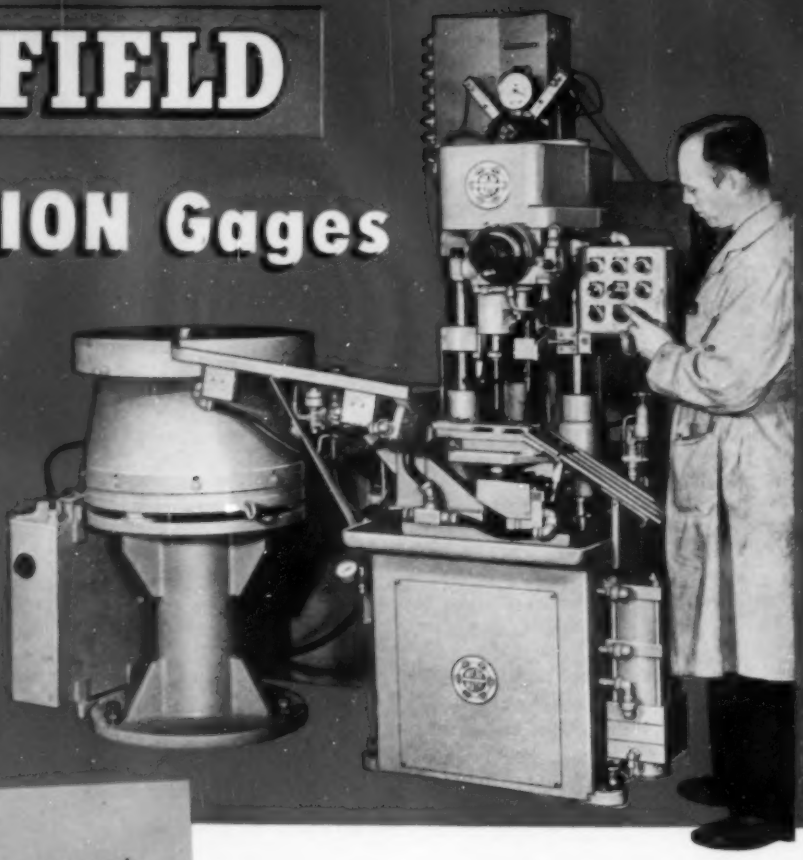
William J. Carroll, Sr., 80, retired superintendent of tools at Baldwin-Lima-Hamilton Corp., died Nov. 20, at Philadelphia, Pa.

SHEFFIELD

AUTOMATION Gages

Assure Fast Accurate Machining

Sheffield Automation Gages are package units, ready-to-use and economically priced, for the control of grinding, boring, drilling, honing, milling, turning and other machining operations.



Mounted on machine tools, they measure work part dimensions and space relationships and instantly translate this information into impulses which in turn:

- Energize signal lights
- Actuate solenoid ejection or classification mechanisms
- Start and stop the machine tool
- Provide feed-back control
- Control cutting tool or grinding wheel positioning and compensation, also time cycle.
- Provide visual dimensional readings

A Typical Application

Here the bore of transmission pinions is being honed on a Micromatic Model 738 Machine and gaged automatically.

If the actual bore size, after honing, is within .0001" of either tolerance limit, white warning lights flash on.

If either tolerance is exceeded, a red or green signal flashes and the faulty part is automatically ejected.

When a predetermined number of rejects pass through in succession the machine is automatically stopped.

The actual size of each bore, as it is gaged can be read on a conveniently located air gage dial or column as built into the machine tool pneumatic circuit.

The Sheffield Corporation, Dayton 1, Ohio, U.S.A.

SHEFFIELD HEADQUARTERS

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MANUFACTURE AND MEASUREMENT FOR MASTERY

Sheffield AUTOMATION ENGINEERS will gladly consult with you about automatizing your production.

World's tallest pile driver...

World's toughest test rig...

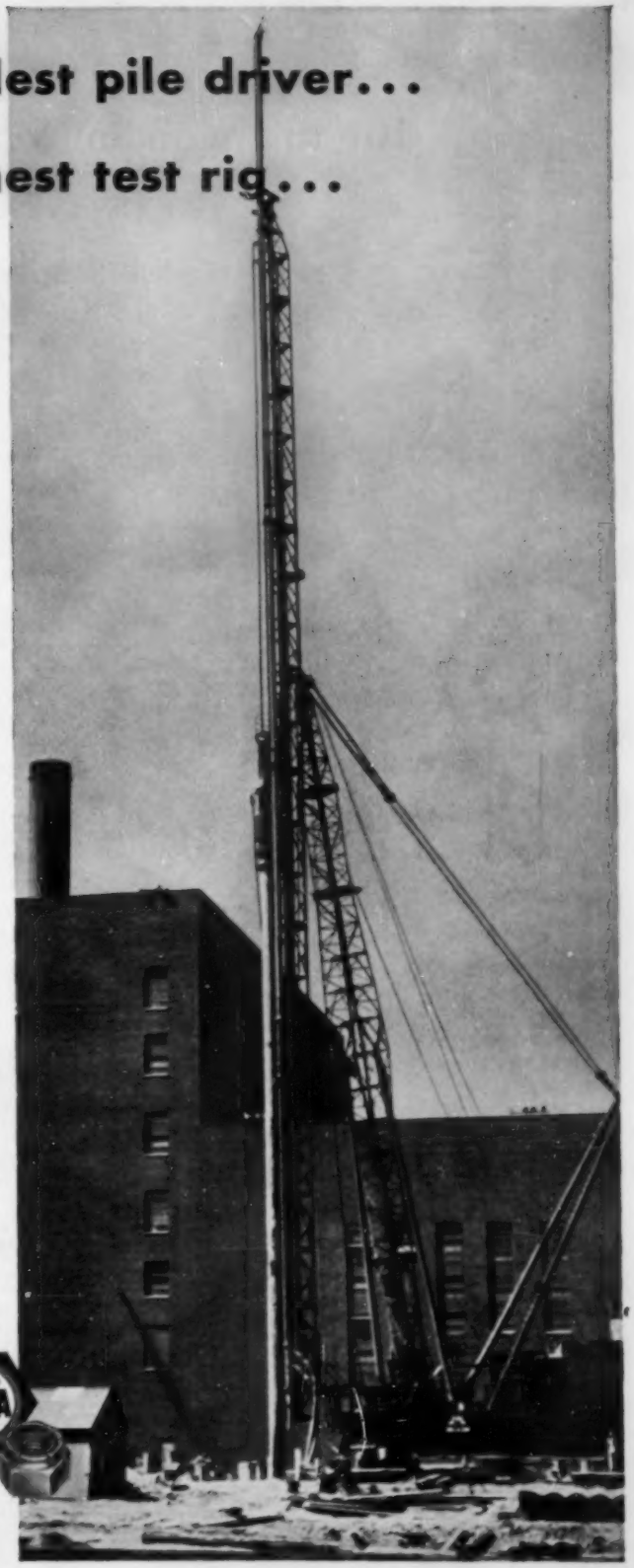
for

Elastic Stop® nuts

Each hammer-stroke of this 270-foot pile driver delivers a 24-foot-ton wallop! It was built by Raymond Concrete Pile Company to drive 200-foot pipe piles for the foundation of units being added to the B. C. Cobb Steam Plant of Consumers Power Company, at Muskegon, Mich.

Raymond makes a practice of using Elastic Stop® nuts for bolting together sections of leads and booms on all their pile-driving equipment. The red elastic locking collar of these vibration-proof fasteners has successfully maintained its grip under these severest of all vibration and impact conditions!

Whether used on aircraft or locomotives; guided missiles or steam shovels . . . more than twenty years of field testing on applications where safety and severe operating conditions demand a fastener that will not shake loose, prove that . . . *you can rely on Elastic Stop nuts.*



ELASTIC STOP NUT CORPORATION OF AMERICA

Dept. M77-125 • 2330 Vauxhall Road • Union, New Jersey

The red locking insert in an Elastic Stop nut guarantees

- reusability
- vibration-proof locking
- thread sealing . . . no galling
- immediate identification
- adaptability to all shapes and sizes of threaded fittings
- suitability to production line assembly methods

The Ideal Gift

for the Woman Who Has Everything . . .

Give Her Smoother Stopping,

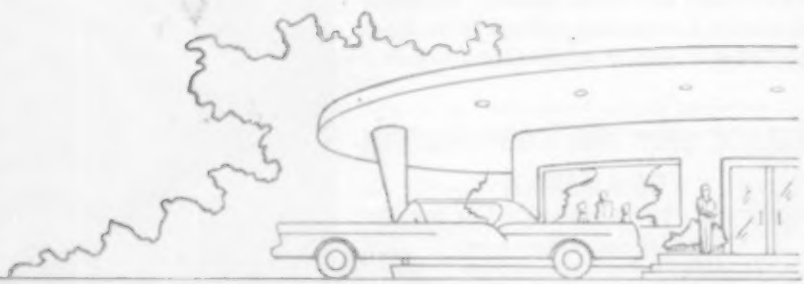
Safer Double-Disc Brakes

You can do it too. You're important to the automotive industry. You know from first hand experience or from reports that Auto Specialties Double-Disc Brakes have proven themselves superior to other brakes. You know that in a recent brake test in the mountains, conventional brakes failed after one trip down the mountain. Auto Specialties Double-Disc Brakes over the same course and under the same conditions still had braking power left after three trips. In other fade tests, foot pedal pressure necessary to stop shoe-and-drum brakes increased from 68 pounds at the first stop to 180 pounds at the twelfth stop. Double-Disc Brakes made twenty-two consecutive stops while maintaining a constant foot pedal pressure of 60 pounds. You know that Auto Specialties Double-Disc Brakes have also proven themselves superior in many other ways.

These are all things you probably know. But perhaps, what you don't know is that the manufacturer of Double-Disc Brakes, Auto Specialties Mfg. Co., Inc., Saint Joseph, Michigan, has received thousands and thousands of individual requests for these brakes. These requests alone would eat up a lot of automobile production. These requests for Double-Disc Brakes show that women are more safety conscious than men. Women are more vitally concerned with the lives of their children while driving. They want better brakes, safer brakes. Brakes that will give them more confidence while driving.

In a tough selling situation, Double-Disc Brakes can make the big sales difference. Thousands of requests for these brakes have poured into dealerships in New York, Detroit, Chicago and Los Angeles. The great promotional effort today is on safety. Safer Double-Disc Brakes will make cars easier to sell. You can do much to see that Double-Disc Brakes are adopted.

If you would like more information about these brakes, write to Auto Specialties Mfg. Co., Inc., Saint Joseph, Michigan.



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SAINT JOSEPH, MICHIGAN

Plants also at Benton Harbor and Hartford, Michigan and Windsor, Ontario, Canada
Manufacturing for the automotive and farm machinery industries since 1908

"To the success of your mechanism"
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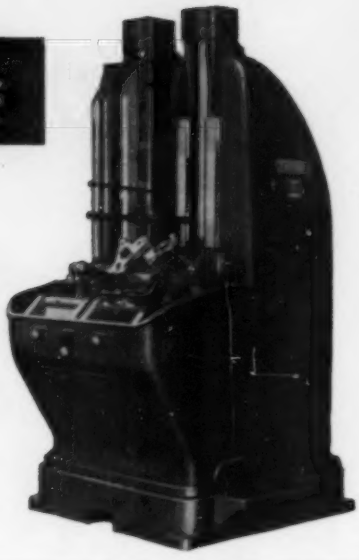
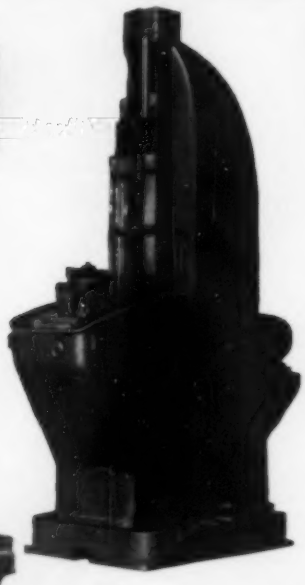
A FASTER *more economical* MACHINE OPERATION



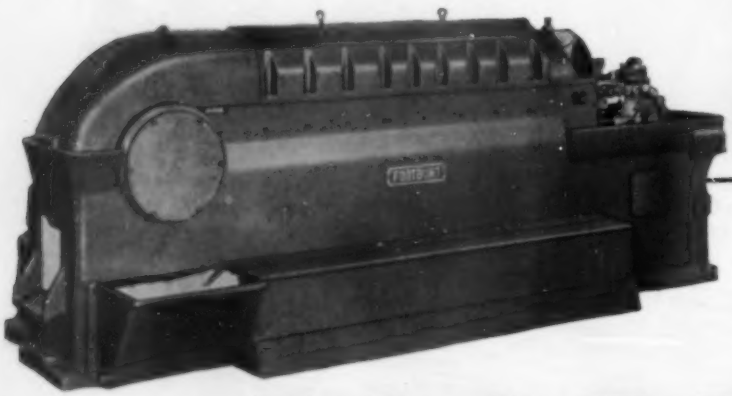
Duplex Surface Broaching Machine. Made in 5, 10, 15 and 25 Ton Sizes.

■ Footburt Surface Broaching may be the answer to your problem of faster machining. Many jobs that were slow and expensive when handled by conventional machining methods are now being produced by Surface Broaching. Production in most cases is as fast as the speed at which parts can be loaded. Yet cutting speeds are so low that the cost of tool maintenance shows great savings. Exceptional finish can be maintained. We will gladly discuss your machining problems with you.



Single Slide Surface Broaching Machine. Made in 5, 10, 15 and 25 Ton Sizes.

THE FOOTE-BURT COMPANY
Cleveland 8, Ohio
Detroit Office: General Motors Building



Continuous Type Broaching Machine. Made in 5 Sizes.

FOOTBURT

PIONEERS IN SURFACE BROACHING

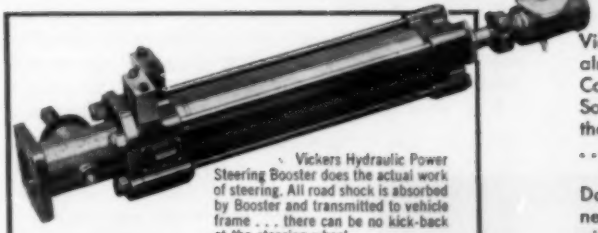
DALLAS *Again Specifies*

VICKERS HYDRAULIC POWER STEERING

30 MORE "SOUTHERN COACHES"

Make a total of 125 buses used by Dallas Railway and Terminal Co. having

VICKERS HYDRAULIC POWER STEERING



Vickers Hydraulic Power Steering Booster does the actual work of steering. All road shock is absorbed by Booster and transmitted to vehicle frame . . . there can be no kick-back at the steering wheel.

Engine-driven Vickers Pump supplies power for steering. Optimum radial and axial running clearances are automatically maintained, resulting in high efficiency and long, trouble-free life.

VICKERS hydraulic POWER STEERING *is Effortless, Positive and Shockless*

7198

WELL PLEASED with the performance of Vickers Hydraulic Power Steering on 55 of their buses already in service in 1953, the Dallas Railway and Terminal Co. specified Vickers on 40 additional buses bought from Southern Coach Manufacturing Co. at that time. This year they have taken delivery on 30 more Southern Coaches . . . again specifying Vickers.

Mr. J. T. Hurry, Superintendent of Equipment for the Dallas property, writes: "The oldest of these jobs have nearly 150,000 miles on them. These Vickers units have given very satisfactory service and to date we have not had to rebuild any of them due to wear."

Vickers Hydraulic Power Steering is durable, dependable, safe, easy . . . takes the fatiguing steering load off the driver and increases his efficiency. The quick maneuverability is especially useful in city traffic. Improved public relations result from the ease with which the driver gets close to the curb for loading. Easily applied to new and existing vehicle designs. Ask for Bulletin M-5106.

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ASME Diamond Jubilee Meeting

Stresses Growing Stature of Engineers

By Paul Kennedy

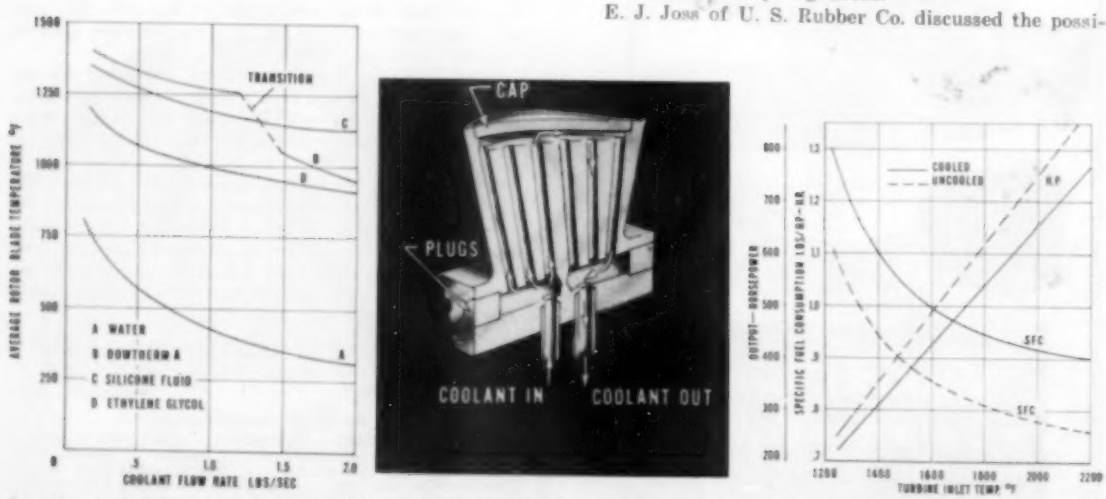
STRIKING as its keynote the theme that the engineer today is and must continue to be a dynamic influence in public affairs outside of his own field of technology, the ASME Diamond Jubilee Annual Meeting in Chicago last month was a tribute to those who have cast aside the "Ivory Tower" approach to problems. This basic tenet was formalized in the form of a slogan—"The Engineer and the World of Commerce and Industry"—and could be seen underlying the texts of many of the 300 technical papers presented. In addition, one whole day of the meeting was devoted to two panels on the subject in general and the specific impact of technological advances on the economy of the country.

Official delegates from 32 professional societies and industrial groups joined in the meeting. Joseph W. Barker, chairman and president of Research Corp., was introduced as the 1956 ASME president. Keynote speaker Roy T. Hurley, chairman and president of Curtiss-Wright Corp., lauded the engineer for his importance in maintaining a high level of prosperity. But he added that we need more rapid advances, explaining in an interview that engineers must take more interest in "engineering management"—finance, scheduling, planning, etc.

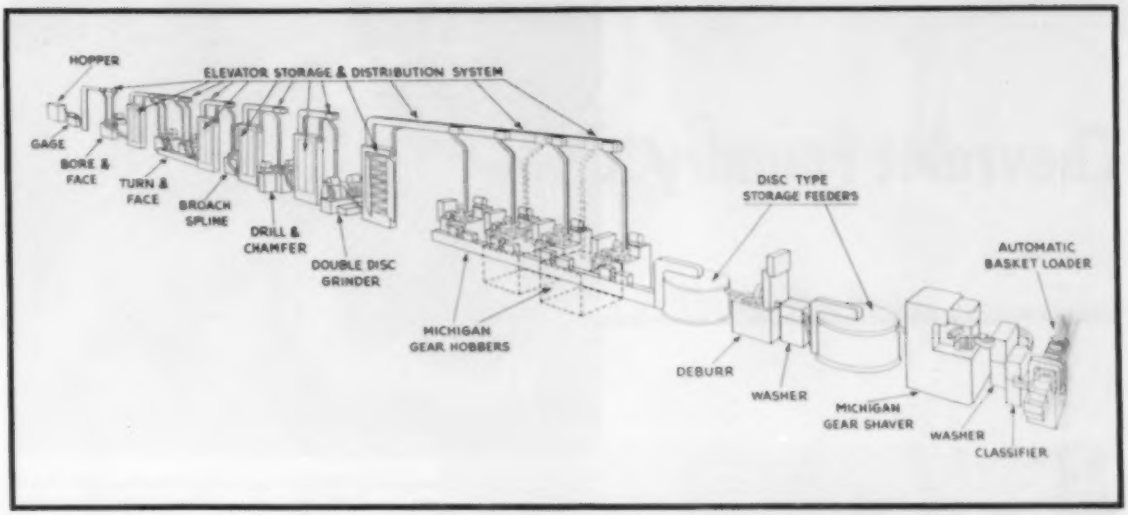
Among the recipients of awards were members of the automotive industries. Charles F. Kettering was named 1955 recipient of the Hoover Medal, granted by a board of the Mechanical, Civil, Mining and Metallurgical, and Electrical Engineers societies. Theodore von Karman received the Guggenheim Medal for aeronautical leadership. Honorary membership in the ASME was granted, among others, to J. B. Armitage of Kearney & Trecker Corp., J. B. Doolittle of Shell Oil Co., and C. G. A. Rosen of Caterpillar Tractor Co.

Automobile tires received attention from two speakers as components most likely to change within a year. The softer, 14-in. tire with increased cross-section will be with us in 1957 models, stated H. H. Waters of Firestone Tire and Rubber Co. Other trends he predicted were the general use of tubeless truck tires in 1956 and eventually for farm equipment; full-depth foam rubber seating; safety foam rubber in roof decks and seat backs; more air springs; and development of a synthetic rubber with characteristics like natural rubber which may eliminate Government rubber stockpiling needs.

E. J. Joss of U. S. Rubber Co. discussed the possi-



Graphs (left)—show rotor blade temperature, and (right)—improvement in power and fuel consumption. Center—liquid-cooled rotor blade of Solar gas turbine (Alport)



Future automated gear production line for finishing green gears from screw machine blanks (Anderson)

bility of wear-resistant polyurethane rubber developments which would make tires last two or three times as long as present tires. Another tire company engineer, K. K. Fligor of Goodyear Tire and Rubber Co. talked of plastics in transporation, predicting that a small airplane composed 90 per cent of plastic (less engine) could be priced $1500 under a similar metal and fabric plane. He also discussed several experimental automobiles with plastic bodies, a plastic trailer top, and a U. S. mail delivery truck body molded from resin and fiber glass which is 1000 lb lighter than a conventional body.

Other automotive developments discussed included valve characteristics and wheel inertia effects on power steering. In addition, W. E. McCarthy and W. A. Van Wicklin of Ford Motor Co. presented data on initial recovery rates and time lag.

Crankshaft design stress-concentration equations were evolved and demonstrated by C. M. Lowell of Worthington Corp.

Automation received a fair share of attention. M. R. Anderson of Michigan Tool Co. said that future automatic gear production lines will have demand type handling with moving storage, overhead distribution systems which do not require electrical or mechanical interlocks. Each machine operates at its own optimum speed, independent of the others. Collection conveyors are near the floor. Salvaged gears can be reprocessed automatically.

Details of the Air Force heavy press program and air cargo operations were subjects of two panel discussions (see AUTOMOTIVE INDUSTRIES, Dec. 1 issue, page 39).

Intricacies of gas turbine design were pinpointed at several sessions. New liquid cooling methods for rotors and blades will allow operation at a gas temperature of 1750 F, without requiring use of more than five per cent strategic alloying material. Sumner Alpert, R. E. Gray and D. D. Drake of Solar Aircraft Co. detailed the problems in redesigning a Navy T-400J shipboard powerplant turbine for such cooling. Based on this single-stage work, a three-stage turbine is now under way, their paper stated.

Revival of pulsating combustion for gas turbines was discussed by F. H. Reynst of France. He showed test results and calculations of experiments with

(*Turn to page* 124, *please*)

INERTIA LOADS	RECOVERY RATES
NO WHEEL	150 DEGREES PER SECOND
30% OF STANDARD	60
40%	50
100%	45
165%	38
218%	30

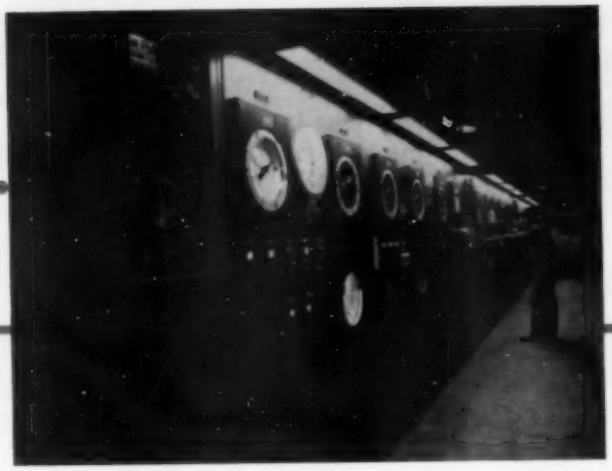
VALUES OBTAINED FROM AUTOMOBILE WHEN RECOVERING FROM TIGHT LEFT TURN AT 10 MPH

	RESPONSE TIME AFTER RELEASING WHEEL (SECONDS)			
INERTIA LOAD	PUMP PRESSURE	LINK CONNECTING	LEFT WHEEL	RIGHT WHEEL
NO WHEEL	0.003	0.003	0.025	0.025
30% OF STANDARD	0.020	—	0.090	0.100
40%	0.058	—	0.140	0.160
100%	0.080	0.085	0.153	0.200
165%	0.109	0.110	0.168	0.230
218%	0.200	—	0.280	0.300

VALUES OBTAINED FROM AUTOMOBILE WHEN RECOVERING FROM TIGHT LEFT TURN AT 10 MPH

Wheel recovery rates and time lag during recovery in power steering system (McCarthy)

Chevrolet Foundry..



This huge panel, designed by Grindle and using Minneapolis-Honeywell electronic units, controls the six cupolas in the Chevrolet foundry

MUCH skillful planning and a host of new equipment have molded Chevrolet's Tonawanda, N. Y., foundry into a well integrated and efficient production operation. The layout of this plant is such that there is a smooth flow of raw materials constantly being transformed into finished products, such as V-8 and six-cylinder blocks, heads, flywheel housings, as well as a large variety of small parts.

To provide ample production of cast iron, there are six new Grindle cupolas equipped with capped exhaust systems. This is claimed to be the first industrial installation of these new furnaces which have a reheat cycle. Grindle also designed a central, single-board control panel. This panel is equipped with Minneapolis-Honeywell electronic units that automatically control the cupolas for their most efficient operation. With this new system, it is possible for one worker to keep a constant check on all of the cupolas during a melt cycle.

At this facility, there are two basic types of iron poured which are used for a wide variety of Chevrolet castings. The first type, referred to as cylinder iron, is made of the following ingredients: Steel 27%, Scrap 30%, Cast iron briquets 25%, Alloy pigs 6%, Pig iron 12%.

The other type is soft iron which consists of: Steel 18%, Scrap 25%, Silicon briquets 2.5%, Cast iron briquets 10%, Pig iron 44.5%.

Sutter core blowing machines are used to make up the barrel cores for six and V-8 cylinder blocks; operator sprays graphite over the mold surface before each cycle

Hot metal from the cupolas is handled by overhead rail-mounted cranes to the various pouring stations or loops. Adjacent to the pouring loops are the Bartlett and Snow foundry floor conveyors, laid out in large ovals, which carry the copes and drags through the complete molding cycle. As the metal is poured, the molds pass under smoke hoods where the fumes are carried off. For safety and better housekeeping, Chevrolet installed over a half-million dollars' worth of Schmieg fume and dust collecting machinery throughout the huge facility, as well as other ventilating facilities.

As the hot molds pass

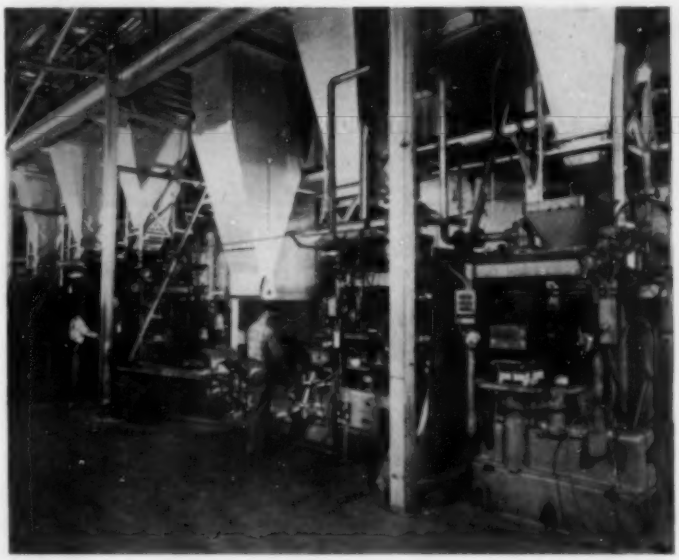
..Has Newest Automatic Equipment

By Thomas Mac New

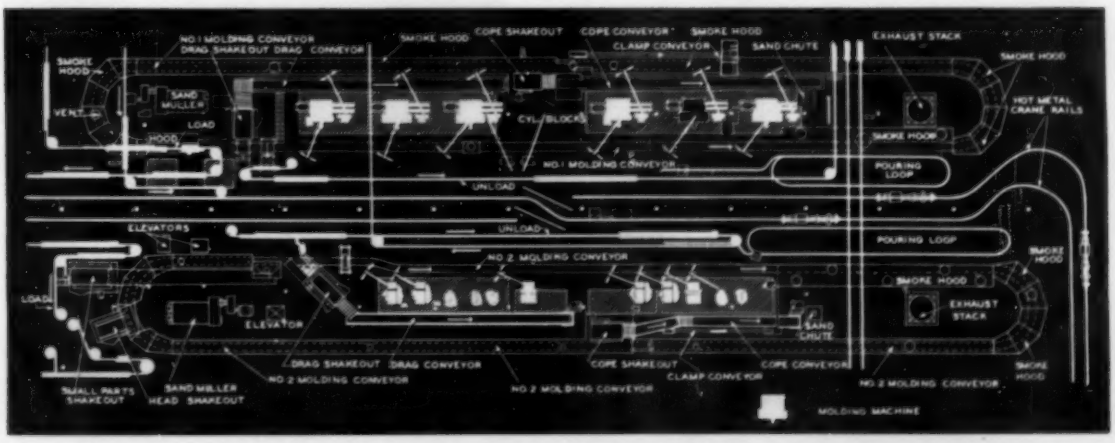
along the foundry floor conveyor, the cope is removed and shuttled to a shakeout machine. When the cope flasks are thoroughly cleaned, they are moved along a conveyor past a series of Osborne molding machines. These machines are constantly engaged in manufacturing the copes for the molding cycle. Sand for the various molding machines is carried by overhead conveyor direct to each point of use.

The cast part remains with the drag and progresses to a point where the casting is removed from the drag and conveyed to a shakeout machine. The part is then hung on an overhead conveyor system built by Planet, which carries it through the plant on its cooling cycle.

In the interim, the drag passes through another shakeout machine. Similarly to the cope, the flask passes a series of Osborne machines preparing the drags. There are six molding lines and one jobbing floor for making up a variety of castings. Separate and distinct parts are produced on each of the molding lines;



A group of International molding machines used on the cylinder head-casting line



Floor plan of two of the six molding lines on the foundry floor: upper line is used by block production while other is used for heads and some small parts

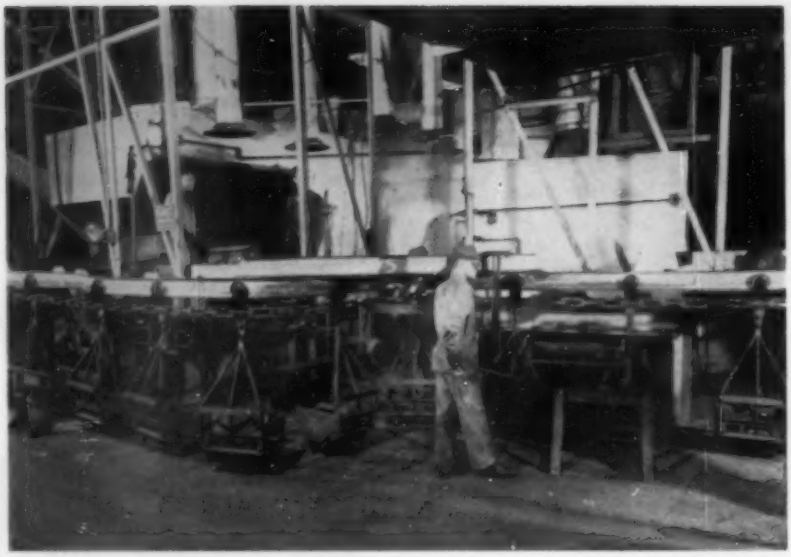
waste sand for the most part is reclaimed by use of a Hydro-Blast system.

Foundry engineers at the Chevrolet plant have designed a very versatile hanger for the overhead conveyor system. This hanger is capable of carrying engine heads, a flywheel, and a large variety of smaller parts. Because of its universal nature, Chevrolet did not have to go in for specialized hangers for each molded part.

By necessity, for the type of parts manufactured in this plant, there is a large area devoted solely to the production of cores for the various molds.

For most of the core production, International core blowing machines are used in conjunction with Sutter rollover units. For the cylinder barrel cores only Sutter machines are utilized. Core sand, like the mold sand, is stored centrally and is distributed to the individual core blowing machines by means of an overhead conveyor belt and crane monorail system.

The floor area throughout the core room is well conveyorized from machines to core pasting, to ovens, and finally to storage. Block cores for V-8 engines, as an example, move on an automatic conveyorized unit built by Inland States. This transfer equipment automatically loads pasted V-block core assemblies into two tower ovens. When the cores have been baked, it unloads them and places them on the carriers of an overhead conveyor. This conveyor in turn takes the core assemblies to the molding assembly lines.



The Planet conveyor system equipped with universal carriers for heads, flywheels, etc., is shown passing one of the many shakeout stations

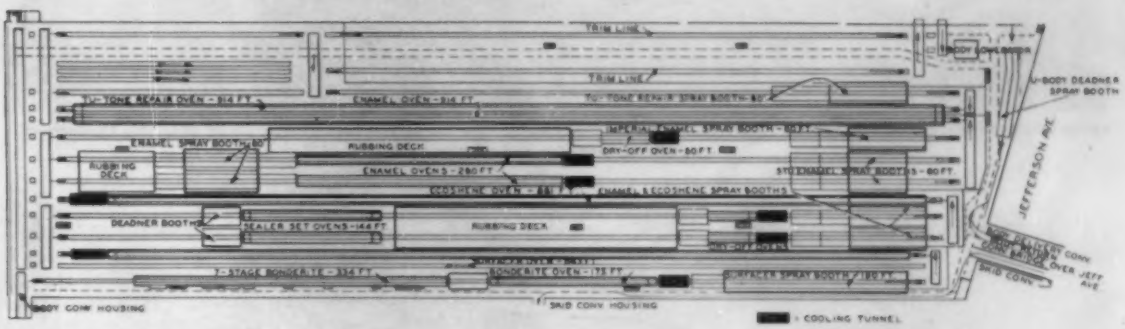
New overhead conveyor carrier for heads, flywheels, and other parts

The bottom of the crankcase is roughed on a Mercury grinding machine

Core assemblies are joined at the rate of 100 per hour on a conveyor which travels approximately six feet per minute. From this point, the cores move onto a roller conveyor which travels three times faster than the assembly conveyor.

Bodies Assembled Before Painting at New Chrysler Plant

CHRYSLER BODY PLANT FLOOR PLAN


TRIM LINE
TRIM LINE
TU-TONE REPAIR OVEN - 216 FT
ENAMEL OVEN - 216 FT
TU-TONE REPAIR SPRAY BOOTH - 80'
ENAMEL SPRAY BOOTH - 80'
RUBBING DECK
IMPERIAL ENAMEL SPRAY BOOTH - 80 FT
DRY-OFF OVEN - 80 FT
RUBBING DECK
ENAMEL OVEN - 280 FT
ENAMEL REFINISHING SPRAY BOOTHS
DEADNER BOOTH
SEALER SET OVENS - 144 FT
RUBBING DECK
7-STAGE BONDERITE - 334 FT
BONDERITE OVEN - 175 FT
SURFACER SPRAY BOOTH - 190 FT
BODY CONV HOUSING
SKID CONV HOUSING
= COOLING TUNNEL
BODY DEADNER SPRAY BOOTH
JEFFERSON AVE

LATEST of body paint operations to be placed in production, the new facilities of the Chrysler Division at East Jefferson (see AI, August 1, 1955, p. 35) are distinctive in many respects. Perhaps the most unique feature, claimed to be a "first" in the industry, is the procedure of assembling the body structure together with fenders, hood, and deck lid prior to metal finishing and painting. Apart from affording more compactness both on body-in-white lines and in the paint shop, this procedure leaves no doubt that perfection of exterior color matching will be assured.

Another noteworthy feature is the introduction of a complex network of automation conveyor systems of a variety of types for transporting bodies through the paint shop, over the trim lines, across the bridge connecting the Kercheval body plant with the assembly department on the other side of East Jefferson, body storage lines, hardware assembly lines, and finally to the body drops at the car assembly line.

Here is a network of some 14 miles of conveyors installed by a number of well known conveyor specialists. The long reach of monorail conveyors leading from the paint shop across the bridge to the start of body storage lines was installed by Anchor Steel & Conveyor. This company also provided the monorail conveyor systems for the hardware assembly lines for Chrysler and Imperial cars. The entire network of floor conveyors in the paint shop (see floor plan) together with the intricate system of elevators at transfer points at the end of each line was installed by Palmer-Bee.

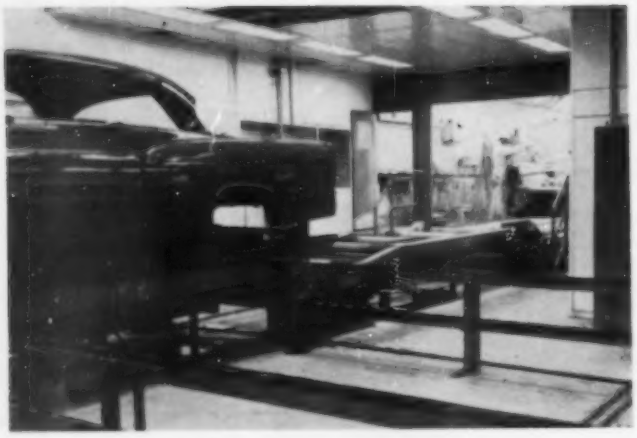
The floor plan reproduced here provides an excellent visualization of the method of operation and flow of production. The cycle begins at the bottom line of the drawing where bodies enter the metal cleaning and Bonderizing equipment, starting with the Peters-Dalton seven-stage Bonderite unit, running some 334 ft in length. Bodies then enter a blow-off booth, and continue into the BLS Fabricators drying oven. This oven is 175 ft long, having a drying cycle of 5.9 minutes at 350 F. Bodies proceed through the cooling tunnel, then enter the 190-ft long Peters-Dalton surfacer spray booth.

It is noteworthy that paint spraying in this booth, as well as in color spray booths, is done by means of automatic spray gun mechanisms of two different types—one with guns mounted on articulated arms; the other with guns operated from a cam-actuated cabinet.

From this point on the flow of work may be readily traced on the floor plan. It will be noted that the ends of the lines are connected by an automatic elevator mechanism for transferring bodies from one line to the next. This is a part of the Palmer-Bee installation.

An extensive system of drying ovens is found here

Automatic transfer conveyors and elevators for scheduling bodies to the various stages in the paint shop — Bonderizing, spraying, cooling and drying



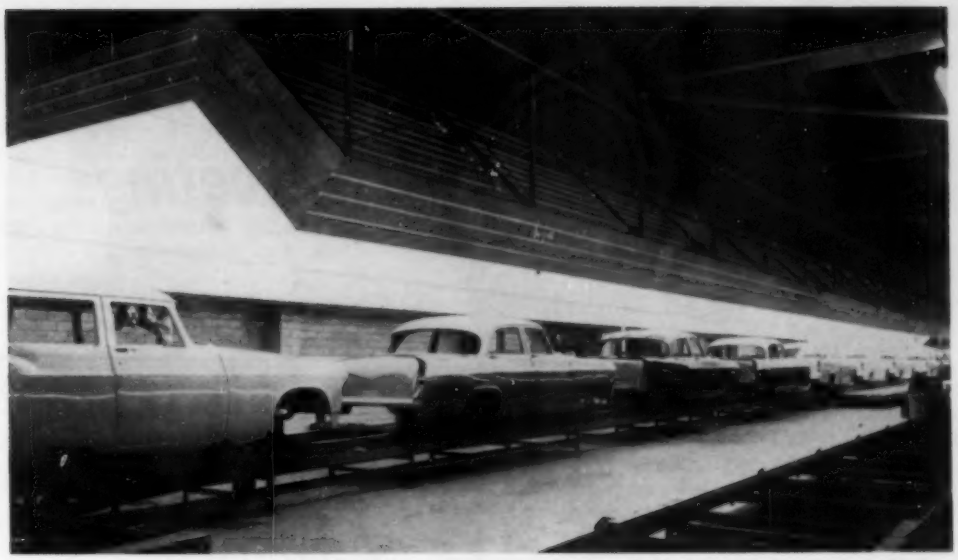
with a total length of 4705 ft. The longest four ovens are: the 843-ft surfacer oven in which bodies are held at 300 F for 30.8 minutes; the 861-ft Ecoshene oven in which bodies are held at 250 F for 31.5 minutes; an enamel oven 914 ft in length with a cycle of 33.5 minutes at 250 F; and the two-tone repair oven, 914 ft in length with a cycle of 33.5 minutes at 225 F. Four of the larger ovens on this floor were installed by Newcomb-Detroit.

As bodies reach the end of the paint line they are subjected to close visual inspection as they move along a conveyor under a 240-ft canopy of fluorescent lights, providing soft, glare-free illumination free from highlights. If repairs are found necessary, the bodies are returned to the paint lines for repair and drying.

Accepted bodies then are routed to the

Above, left—Here are Chrysler bodies moving through one of the color spray booths. In the background, about midway, is one of the automatic spray gun units spraying the roof area.

Immediate left — The body in the foreground has just left a paint spray booth and has been transferred automatically to the conveyor leading to the drying oven.



Perspective of the illuminated canopy over the final paint inspection line

automatic Lowerator, installed by R. C. Mahon, and controlled by an Anchor Steel & Conveyor automatic control system. The Lowerator moves bodies, one by one, to the first floor where they are trimmed. In addition to the regular line of bodies handled on the second floor, there are convertibles and Estate Wagon bodies as well. These are held on the floor and routed to the trim lines at the upper section of the drawing where special trim can be installed without disturbing the high production line.

Following completion of trimming, the bodies return to the second floor on the long monorail conveyor, starting at the upper right hand corner of the floor plan, and are transported across the bridge as shown. Estate Wagon and convertible bodies are hooked onto this conveyor just before bodies enter the underbody deadener spray booth.

As the Anchor monorail reaches the end of the bridge the bodies are transferred onto a cross conveyor system, then onto a floor type conveyor. The system at this point was installed by Allied Steel & Conveyor, using Palmer-Bee elevators.

Bodies move cross-wise along this line until they reach the distribution center controlling the scheduling of body storage lines. Here again is a network of floor conveyors and Palmer-Bee elevators, installed by Allied Steel.

From the body storage lines, bodies are delivered according to schedule to two hardware assembly lines—one for Imperials, one for Chryslers. These monorail lines were installed by Anchor Steel.

Needless to say, an extensive system of safety devices is required to assure smooth, trouble-free operation of automatic conveyor systems, elevators, and transfer conveyors. Such controls are initiated automatically to stop a conveyor line at the right time, to stop the forward progress of a body on an elevator, and to right the body as it reaches the end of the Allied floor conveyor at the point of transfer to body storage lines. (*Turn to page* 120, *please*)

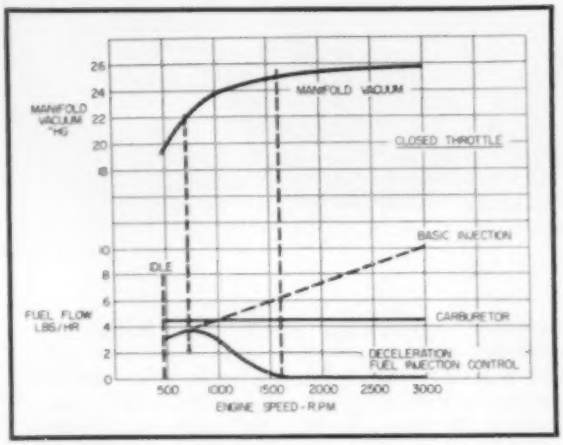
Painted and trimmed Chrysler bodies entering the body storage area from transfer points in the background

SAE GOLDEN ANNIVERSARY
Fuels and Lubricants Meeting

ATTENDANCE is generally deemed to be a reliable yardstick of the interest in and subsequent success of any technical meeting. On this basis, then, the SAE Golden Anniversary Fuels and Lubricants Meeting in Philadelphia last month was one of the most successful ever held from the viewpoint of the number of participants and their keen concern with current fuel and lubricant problems.

Automotive engine designers were again called upon to match engine requirements to tomorrow's gasolines. Higher-octane fuels will be more sensitive to temperatures and speeds, reported P. C. White and A. P. Boyd of American Oil Co. (Texas) and C. J. Comke of Standard Oil of Indiana. Modern engines have maximum octane requirements at higher speeds, due to use of automatic transmissions. As sensitivity (difference between Research and Motor method octane rating) of full boiling range fuels increases, road rating falls off; it also declines at increased speeds. The authors brought out this point from road tests with several high-compression V-8 engine powered cars.

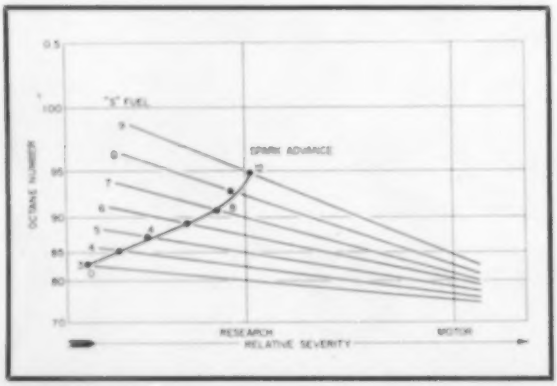
A new method for predicting the antiknock performance of gasoline in various automobiles was presented by R. V. Kerley and K. W. Thurston of the Ethyl Corp. The method involves determining the "severity patterns" of automobile engines. Heretofore, the authors explained, it has been possible to measure the sensitivity of a fuel by comparing its performance with the standard laboratory reference fuels. A similar point of comparison was lacking for engine severity — meaning the way a given engine appreciates or depreciates rated fuel antiknock quality. Now, however, it is possible to measure the relative severity of an automobile engine in terms of standard single-cylinder laboratory knock-test engines. The method involves a nomograph, combining Research and Motor ratings of the "S" reference fuels, with actual ratings and spark advance the engine gives each fuel.



Fuel flow with deceleration control on injection system (Miller)

Gasoline volatility problems under study by Coordinating Research Council were described and results brought up to date in a paper by W. P. Dugan and J. G. Moxey, Jr., of Sun Oil Co., F. T. Fennigan of Pure Oil Co., and Gilbert Way of Ethyl Corp. Subjects covered included effect of volatility on oil dilution, vapor lock and hot starting, road testing techniques and methods of expressing volatility.

Fuel injection is not likely to give a direct gain in fuel economy, asserted F. C. Mock and W. C.



Severity line for an engine, established by spark advance in degrees at 1000 rpm causing four "S" fuels to knock, plotted on nomograph of "S" fuels 3 to 9 (Kerley)

Suttle of Bendix Aviation Corp. They provided a quite thorough outline of the problems and possibilities in passenger car fuel injection and concluded that reliability and cost are the present deterrents, gains in performance at low speeds do not now match those at high speeds.

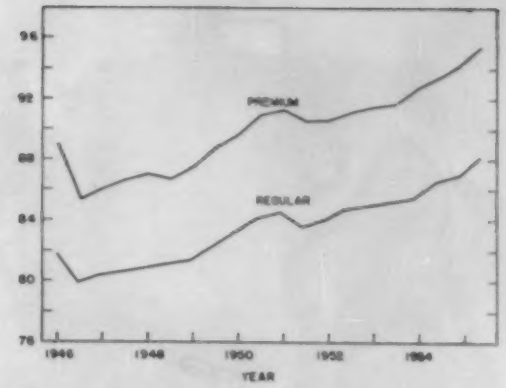
Describing a specific port injection system,

By Paul Kennedy

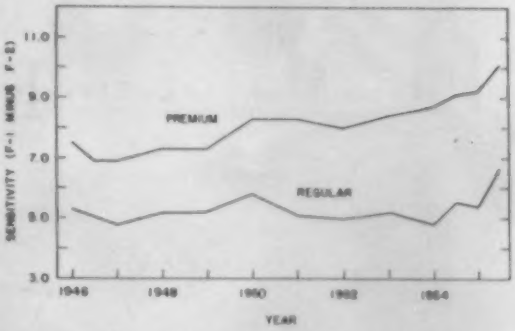
Sidney E. Miller of American Bosch Arma Corp. indicated the price of the system in volume production would be about twice that of carburetors. There was some difference of opinion from the floor as to the merits of injection, particularly in regard to fuel improvements required.

Engine deposits are formed in part from nitrogen oxides, reported R. S. Spendt, C. L. Wolfe and D. R. Stevens of Mellon Institute of Industrial Research. Varnish was said to be formed in large part due to reactions of nitrogen dioxide with gasoline. Sludge formation at low temperatures was found to be inhibited by oil additives without acid-neutralizing capacity, said Esso Research and Engineering Co. speakers D. T. Rogers, W. W. Rice, and F. L. Jonach. In contrast to previous assumptions, they stated, their work indicates most deposit-causing agents are low-molecular-weight, volatile materials which are soluble in mineral oil, being converted to insoluble products in the engine. Their tests found unexpected differences between engines with hydraulic and solid valve lifters — those with hydraulic lifters had much less lifter pitting and cam lobe wear, best gasoline and oil mileage, highest used oil viscosities, but heaviest intake valve tulip leposits.

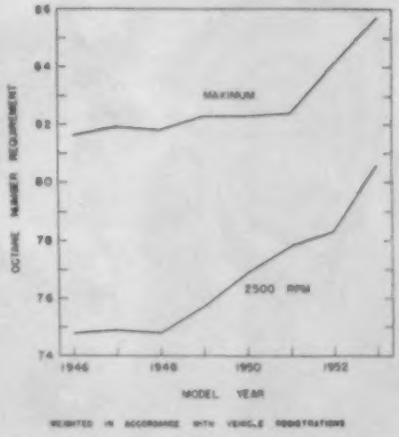
Details of a jointly-sponsored road test showing superior engine cleanliness, due to the use of a lubricating oil with a new type dispersant, were presented by R. I. Potter, formerly of the manufacturing department of the Standard Oil Co. (Ohio), and now with the Ford Motor Co., R. H. Albrecht of Sohio, and Kent Hyatt of Du Pont. Based on the operation of 30 taxicabs driven 50,000 miles each, the test demonstrated the performances of 10 oils containing a variety of types of additives and concentrations in the same base oil. The MS-LD (motor severe-low duty) oil containing the new dispersant gave superior engine cleanliness in the road test. The use of MM (motor medium) oils resulted in extremely dirty engines with MS-DG (motor severe-Diesel general) and DS (Diesel-severe) giving only moderately clean engines in this severe low duty type driving. These same oils evaluated in laboratory engine tests gave correlating results in most cases, it was pointed out. (*Turn to page* 132, *please*)



Trend in antiknock quality of premium and regular gasolines (Boyd)



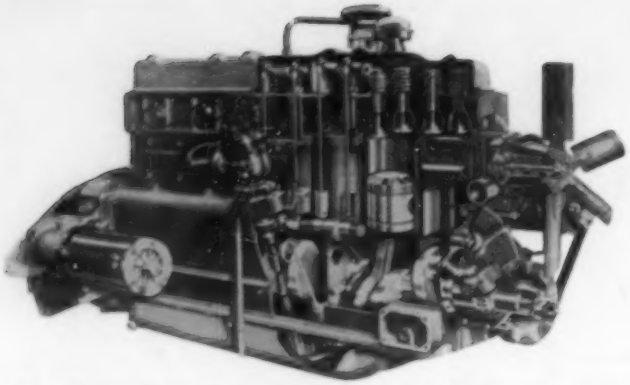
Trend in motor gasoline sensitivity (Boyd)



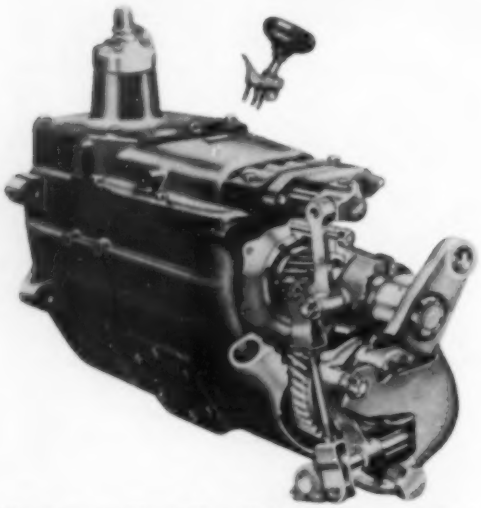
Octane requirement of post-war cars (Boyd)

British Trucks

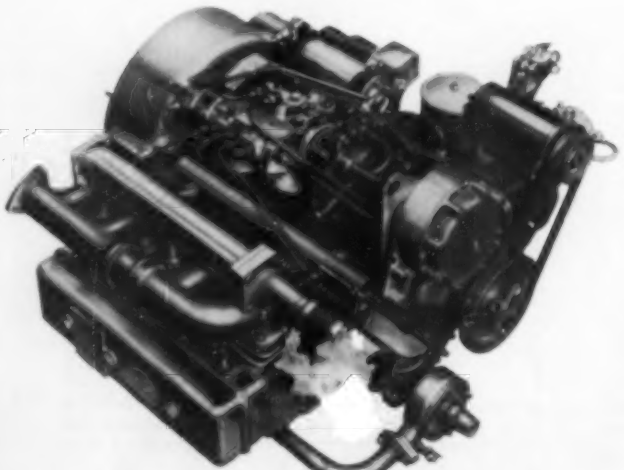
By David Scott



Six-cylinder engine for Commer's new medium-weight Superpoise trucks, developing 91 hp at 3100 rpm



Commer overdrive adds a fifth gear to the standard four speed transmission



Horizontal engine for underfloor mounting in the Albion Nimbus bus

GLASGOW, SCOTLAND

In the off-years between the biennial Commercial Motor Shows in London, the Scottish Show in mid-November is the only full display in this country of new British trucks and buses. Glasgow's Kelvin Hall took on a new importance this year in view of the British motor industry's increasing emphasis on transport vehicles, arising from the growing demand abroad for such types, and the uncertain future for passenger car exports.

Production in 1955 is expected to reach 310,000 units—15 per cent above last year's record figure. The U. K. thus achieves approximately the same nominal output per head of population as in America, although the proportion for cars is very much less. Exports constitute about half the output, and their value will approach some $235 million.

Recent import cuts imposed by Australia and New Zealand, the largest two markets, are not viewed with alarm by manufacturers, since the demand from other overseas countries continues to outstrip production. This is, in fact, a developing trend, and many makers are already quoting up to 18 months' delivery time, particularly for the heavier and more specialized trucks. Shipments of chassis exceed those of completed vehicles in many cases, with South Africa, Nigeria and India among the leading customers for these.

The Glasgow exhibits reflected to some degree the more generous statutory limits, which became effective in April, on the length, width and axle loading of commercial vehicles used in Britain. For example, a maximum width of 8 ft is now allowed against 7 ft, 6 in. previously. A further easing of size restrictions is expected next year, when a 30-ft length will be allowed for double-deck, four-wheel buses. These concessions will enable the U. K. to cater better to those overseas countries where heavy loading of large vehicles is common.

Featured at Scottish Motor Show

Yet retention of the 20 mph limit for laden trucks of over three tons continues as a hindrance to U. K. designers, who are trying to meet the need abroad where higher road speeds are normal.

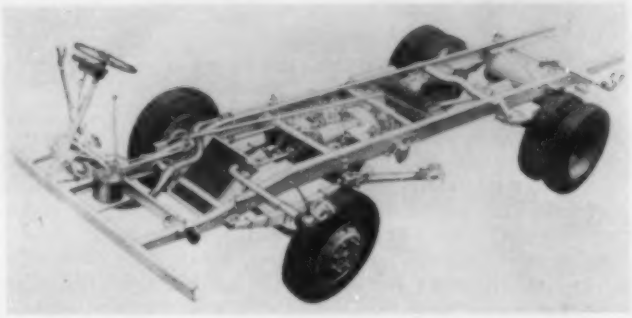
But with long-term prospect of expanded sales, many British firms are stepping up production and broadening the range of their products. For instance, Associated Commercial Vehicles has undertaken a major retooling at its A.E.C. plant to boost output of its 470 cu in. 112 hp six-cylinder Diesels to 150 per day. Leyland has strengthened its competitive position by the acquisition of Albion in 1951 and of Scammell in June, 1955, and now claims to be the world's largest truck and bus exporter. Its production has risen by a quarter during the past two years, and exports have jumped to two-thirds of total sales.

For the Scottish show, Commer, a member of the Rootes Group (Humber, Hillman, Sunbeam and Karrier), brought forward several new models. In the lightweight class, the "Superpoise" panel vans and pickups have a payload rating of ¾ and 1¼ tons, the main difference being the sizes of the leaf springs and tires. The power unit, developed from the Humber Hawk engine, is a four-cylinder ohv rated at 56 hp at 3400 rpm, with a maximum torque of 104 lb/ft at 1600 rpm. The integral cylinder bores are plated with porous chrome, and compression ratio is 6.25 to 1 to permit the efficient use of low-octane gas. Carburetor is a Solex downdraft. A forward-control version is also offered with wheelbase extended to 10 ft 3 in. from the standard 9 ft 4 in. The van body has a capacity of 309 cu ft, and is fitted with sliding doors.

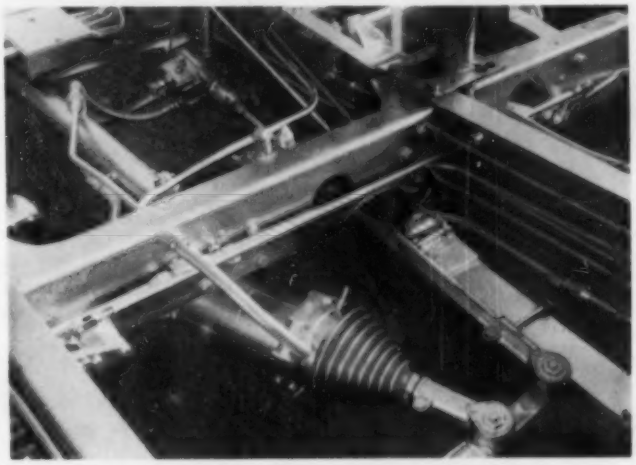
The new ohv engine, together with its four-speed synchromesh gearbox, also powers the Karrier "Bantam" 2-ton chassis. For this application it is governed at 3000 rpm to deliver a maximum of 53.5 hp. In an attempt to broaden the market for the Bantam, Karrier is offering it as a fully-equipped mobile retail store.

Commer's new 3-, 4-, and 5-ton Super-

(*Turn to page* 126, *please*)



Albion Nimbus bus chassis has a steeply inclined radiator which gives good ground clearance without raising the floor height



Power-assisted steering on Daimler Freeline chassis

Land Rover 10-passenger station wagon on 107-in. wheelbase chassis

New Ford Assembly Plant Has Separate Truck and Car Lines

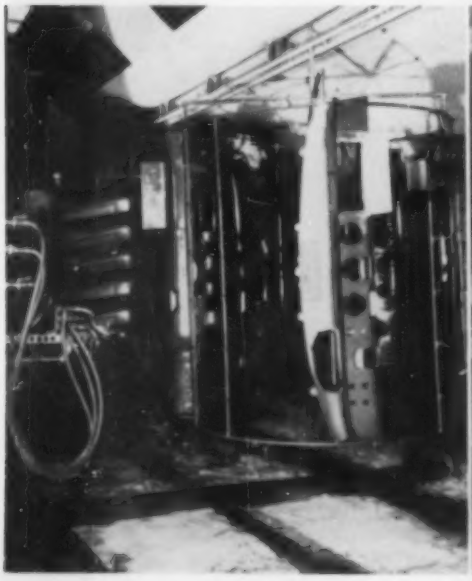
ONE of the most recent additions to the long line of Ford Div. modern assembly operation is the huge 40 acre Mahwah, N. J., facility (see AI news section, July 15.) By taking advantage of the vast knowledge gained in planning and installing 15 other assembly plants throughout the country, Ford has placed in Mahwah the latest materials handling and assembly equipment that is economically suited to its purpose of producing some 640 cars and trucks per shift.

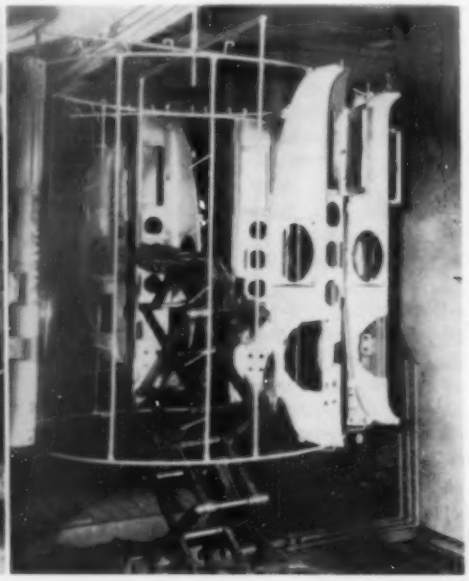
By Thomas Mac New

A departure from former Ford practice in other assembly plants is the separation of passenger car and truck assembly and sub-assembly lines. Carrying this arrangement one step further, the plant has broken down its passenger car lines by trim options for the various body styles.

To provide for an efficient overall assembly procedure, Ford took great care in designing an integrated materials handling system. As D. S. Harder, vice president manufacturing, pointed out, "Industry today recognizes that by improving our methods of handling materials we are exploiting one of the most lucrative potential areas for cost reduction." With the Mahwah setup, there is a relatively uninterrupted flow of material from the receiving dock to the final line. At the point of receival, the procedure starts with mechanized unloading followed by tow-train delivery to the storage area. Material is then moved from storage to the line. For manual handled material, stock is provided for a minimum of eight hours' production; unit load material is on hand for four hours' production. Approximately 2200 tons of material is unloaded from the receiving docks daily at Mahwah. Approximately 75 per cent of this material will be handled twice.

Link-Belt supplied the entire conveyorized materials handling system which is understood to have cost approximately $3½ million. The Ford Mahwah system utilizes about seven miles of overhead conveyors and four miles of floor-type conveyors. The conveyor system includes 41 cam operated lift tables, 11 hydraulic lift tables, 46 hoist monorails, 53 bridge cranes, and 39 gravity roll beds as well as some other pieces of equipment. Of the 11 miles of conveyors,





FAR LEFT— Automatic paint spray booths used for small parts. Guns travel over a contoured plate in a horizontal plane. The conveyor hangers rotate.

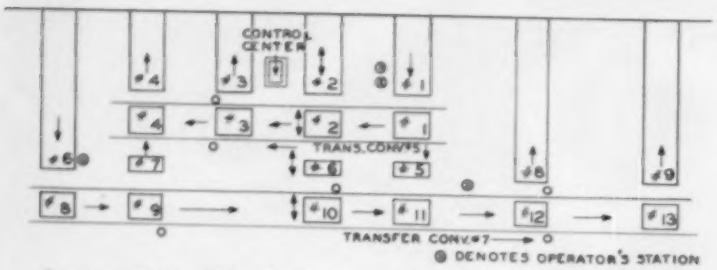
NEAR LEFT— Inside painting is done by traveling jack-mounted gun.

The Link-Belt transfer table and conveyor combination in the foreground automatically transfers bodies to any one of the five Link-Belt roller flight selectivity conveyors. All operations are governed by the control panel on the balcony.

there are 29 overhead trolley conveyors, 28 slat conveyors, 74 chain-driven floor conveyors, and 12 powered roll conveyors.

While planning the Mahwah installation, Ford engineers looked into the numerous types of industrial trucks that were currently available. During their survey, they came up with various pieces of power equipment which were suited to their operation and would help them improve the facility. The fork truck selected was a propane-powered unit capable of stacking materials 18 ft high. This increased Ford's storage potential by 25 per cent over the equipment used in the former assembly plant. For short haul work, a grip coupler type industrial truck, which had been designed with an operator's seat, was selected. Low mast industrial trucks and walking-type grip

This Link-Belt automatic transfer car moves bodies from the head end of five selectivity and roller flight conveyors to a gravity roll bed and slat conveyor for body trim operations.



Sequence of Operations for System of Conveyors and Transfer Tables Shown Above. Control is from Center 15, One of 125 Centers.

Load approaching discharge end of conveyor #1 can follow any of three transfer sequences:

SEQUENCE "A"—Load travels automatically across transfer table #1 and power roll conveyor #5, onto transfer table #11, transfer table #11 descends depositing load on conveyor #7.

SEQUENCE "B"—Operator pushes button located at end of conveyor #1 which energizes selective automatic circuit to transfer load to conveyor #3. Load travels automatically onto transfer table #1, which descends depositing load on transfer conveyor #5. Load travels on conveyor #5 to transfer table #3, which rises and discharges load onto conveyor #3.

SEQUENCE "C"—Operator pushes button located at end of conveyor #1, which energizes selective automatic circuit to transfer load to conveyor #4. Load travels automatically onto transfer table #1, which descends depositing load on transfer conveyor #5. Load travels on conveyor #5 to transfer table #4 which rises and discharges load onto conveyor #4.

• • •

Load approaching discharge end of conveyor #2 trips end of travel limit switch and stops. Upon proper push button signal, load can start and follow any of three transfer sequences

SEQUENCE "D"—Operator pushes button located at the end of conveyor #1, load travels automatically across transfer table #2 and power roll conveyor #6 onto transfer table #10. Transfer table #10 descends depositing load on conveyor #7.

SEQUENCE "E"—Operator pushes button located at end of conveyor #1 which energizes selective automatic circuit to transfer load to conveyor #3. Load travels automatically onto transfer table #1, which descends depositing load on transfer conveyor #5. Load travels on conveyor #5 to transfer table #3, which rises and discharges load onto conveyor #3.

SEQUENCE "F"—Operator pushes button located at end of conveyor #1, which energizes selective automatic circuit to transfer load to conveyor #4. Load travels automatically onto transfer table #2, which descends depositing load on transfer conveyor #5. Load travels on conveyor #5 to transfer table #4, which rises and discharges load onto conveyor #4.

• • •

Load approaching discharge end of conveyor #4 can follow either of two transfer sequences:

SEQUENCE "G"—Load travels automatically onto transfer table #8. Transfer table #8 descends and deposits load on transfer conveyor #7. Load travels along conveyor #7 until it approaches transfer table #12 (See seq. "I" and "J".)

SEQUENCE "H"—Operator pushes button located at end of conveyor #6, which energizes selective automatic circuit to transfer load to conveyor #4. Load travels onto transfer table #8, which descends and deposits load on transfer conveyor #7. Load travels along conveyor #7 until it reaches transfer table #9, which rises and discharges load onto power roll conveyor #7. Load traveling onto roll conveyor #7 trips a limit switch, which causes transfer table #4 to rise. Load continues to travel across roll conveyor #7 and transfer table #4, until it has been discharged onto conveyor #4.

• • •

Load traveling along transfer conveyor #7 approaching transfer table #12 can follow either of two sequences:

SEQUENCE "I"—Operator pushes button located near transfer table #12, which energizes selective automatic circuit to transfer load to conveyor #8. Load travels onto table #12, which rises and discharges load onto conveyor #8.

SEQUENCE "J" — Load traveling along transfer conveyor #7 automatically passes over transfer table #12 and continues onto transfer table #13. Transfer table #13 automatically rises and discharges load onto conveyor #9.

• • •

At the end of a shift, operator pushes button energizing reverse circuits of conveyor #2 and #2 and #10 table rolls and power roll conveyor #6.

SEQUENCE "K"—Operator pushes button energizing automatic transfer circuit, to transfer loads from conveyor #1 to conveyor #2. Loads then follow a normal transfer sequence onto conveyor #2 until operator stops stripping operation.

SEQUENCE "L"—Operator pushes button energizing automatic circuit to transfer loads from conveyor #6 to conveyor #2. Loads approaching end of conveyor #6 travel onto transfer table #8 which descends and deposits load onto conveyor #7. Load on conveyor #7 travels to table #10 which rises and discharges load onto power roll conveyor #6. Load traveling onto roll conveyor #6 trips a limit switch, which causes transfer table #2 to rise. Load continues to travel across roll conveyor #6 and transfer table #2, until it is completely on conveyor #2. Note: The purpose of sequence "K" and "L" is to permit complete stripping of either conveyor #1 or conveyor #6 at one time or also to partially strip both conveyors #1 and #6 simultaneously. Stripping operation described above takes place in conjunction with operation of conveyor located at the far end of conveyor #2.

• • •

At the beginning of following shift, operator pushes button restoring normal direction of travel to conveyor #8, table rolls #2 and #10 and power roll conveyor #6. Discharge from conveyor #2 now can take place as described in sequences "D," "E" and "F."

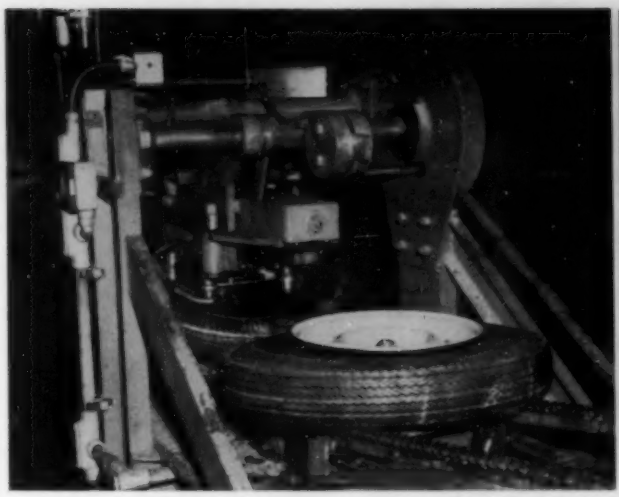
couplers were purchased for highway trailer unloading. In the storage area modular storage bins, racks and work tables were selected. This type of equipment permits Mahwah to have complete flexibility of its huge storage area.

Automatic control plays a big part in the Mahwah assembly operation for the paint lines, conveyors, welders, and allied equipment. Although Ford has standardized on certain basic control components, it has a completely flexible system due to the varied production requirements. Electric control units are made by General Electric and meet the rigid specifications and requirements laid down by the Ford manufacturing group. There are 125 control centers at Mahwah which are used for the various production processes.

A typical control center, #15, for a series of conveyors and transfer tables, consists of 400 relays, main breaker, 32 induction motor control panels, and five electronic control drives. This unit serves 32 induction motors, five variable speed motors, 67 limit switches, and 14 solenoids. The center has a 440 v, 235 amp feeder. There are 30 conduits from 1¼ in. to two inches, leaving the center on the secondary side. All of the control stations measure 20 in. in depth and 7.66 ft high, but vary in length according to the number of sections required. Station 15, for example, is 23.33 ft in length.

The paint system for body parts was installed by Sweitzer and is one of the most modern in any assembly plant. To keep paint flowing to the numerous lines, engineers have provided 18 pipe lines from the central source in two loop feed systems. The pipe lines handle 15 enamel colors, two prime paints applied to bodies before they are enameled, and one black enamel line which feeds chassis parts spray booths.

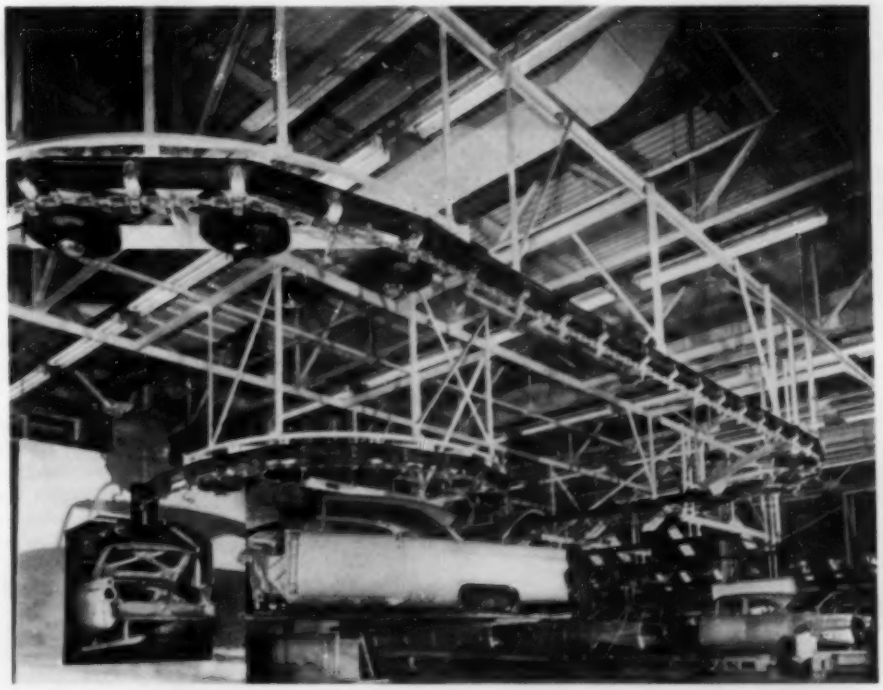
The small parts paints system is completely automatic. Initial-



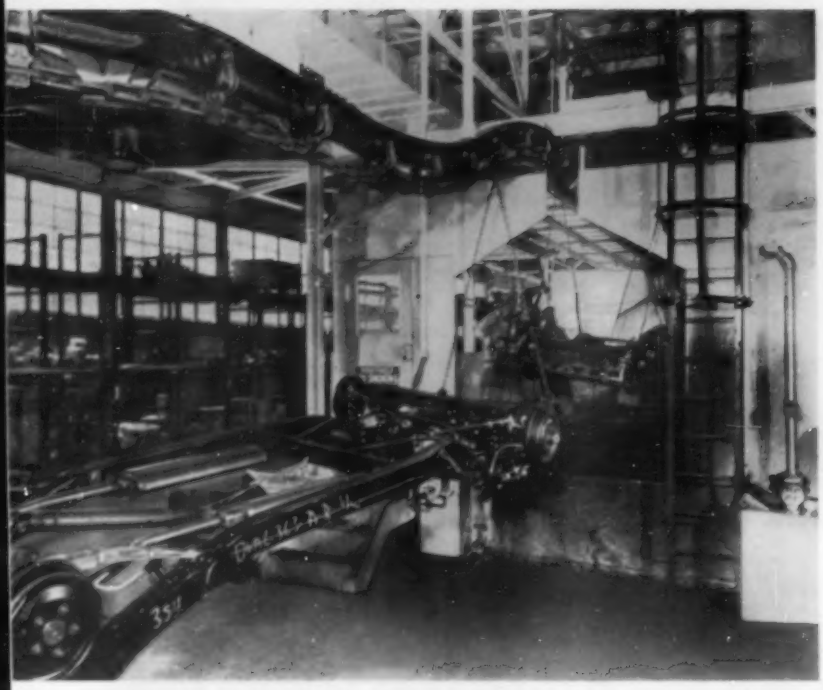
Automated tire mounting machine rolls tubeless tires onto wheel rim.

Tires are automatically inflated through the bead at this station.

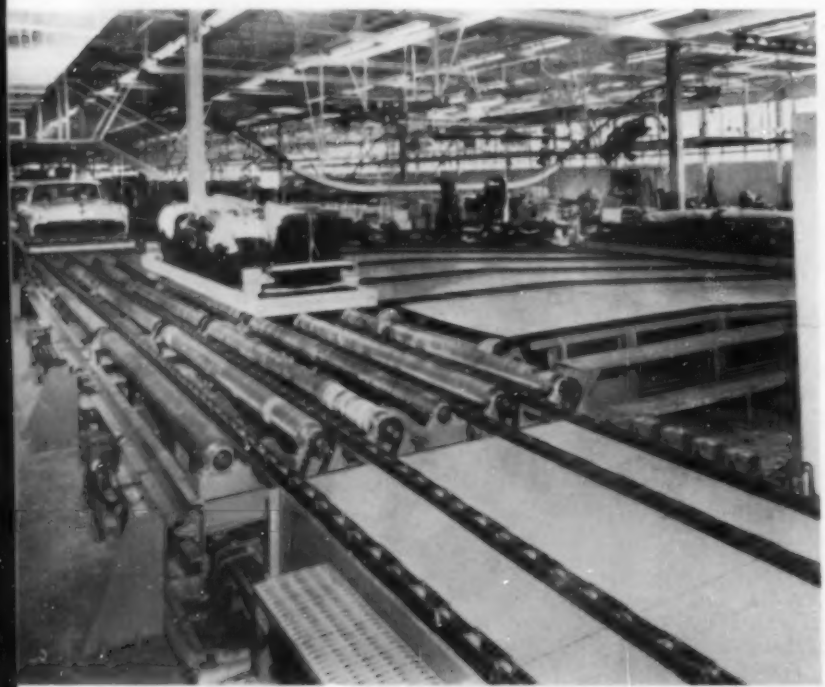
ly, parts are manually placed around a circular conveyor hanger which is suspended by a monorail and driven by a sprocket and chain mechanism. On each conveyor hanger there is a horizontal wheel located between the top of the carrier and the monorail. As the carrier or hanger enters the paint spray booth, the wheel is engaged by a friction drive, thereby rotating the carrier and the workpieces. Paint spray guns are pre-located and travel over contoured plate arrangements secured to the wall of the spray booth. There is a series of such mechanisms in each booth. With the carrier rotating and with the gun traveling in a vertical line, the spray covers all exterior surfaces of the small parts. For the inside surfaces, a gun is mounted on a long scissor jack. This jack is raised as the carrier is positioned over it, thus permitting



An overhead trolley conveyor 1420 ft long carries phosphate-coated bodies into a drying oven.



Partially assembled chassis are carried on an overhead trolley conveyor through the paint spray booth and oven to the final assembly line.



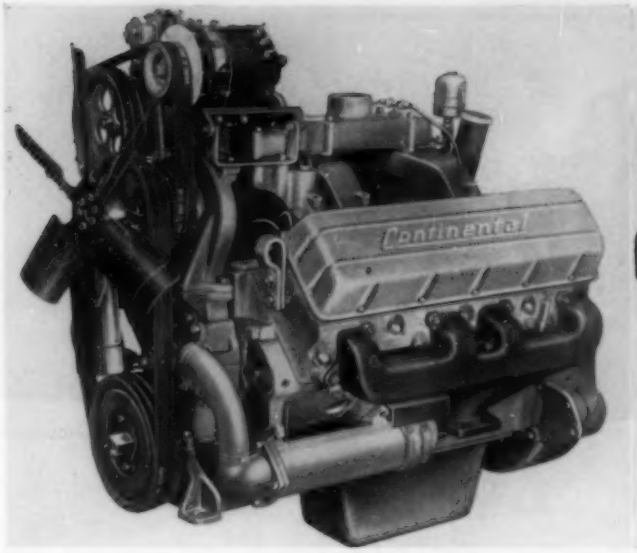
Commercial chassis for export are packed on a six-strand conveyor and then are transferred by means of hydraulic lift tables to a four-strand boxing conveyor.

the jack to be raised and then lowered in the center of the conveyor hanger as it travels with the hanger and while the hanger is being rotated.

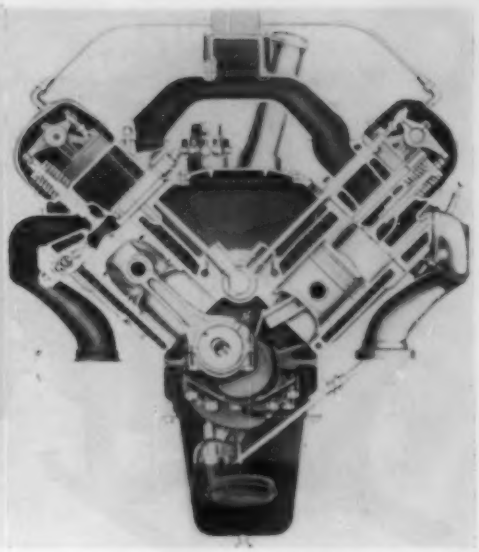
Another unique installation in the Mahwah plant is the skid pickup and return. These skids are used to support the body through metal finish, paint, and trim departments. When the body is picked up at the body drop, the skids are released to a floor conveyor which transports the skids to an overhead conveyor. Automatic controls are used for the mechanism which picks the skids off of the floor conveyor and places them on the hangers of the overhead conveyor. The engaging mechanism, which consists of two arms with a toggle pickup, is supported by a large-diameter shaft driven by an electric motor through a gear reduction and chain drive. This mechanism, built by Link Belt, carries the skids through a cleaning operation and returns them to the body construction department.

The plant also has a well-automated line for putting tires on the wheels. Upon leaving the paint line, the wheels ride an overhead conveyor to the tire and wheel assembly station. At the start of this station, there is an aligning guide to properly position the wheel on a belt conveyor. The conveyor hanger rides up a ramp and over a hump to insure clearance when it unloads the wheel. The wheel, which is in a vertical position, hits two knockdown bars which force the wheel in a horizontal position. The belt conveyor then deposits the wheel onto a gravity roller conveyor which in turn transports it to a fixture on a chain conveyor. At this point, an operator places a tubeless tire on the wheel fixture. In the next phase, the tire is rolled onto the wheel. This tire mount machine is timed by a cam and chain arrangement and installs the tire by means of two arms which move around the periphery of the wheel. Each arm is equipped with a shoe for depressing the tire and rollers for guiding the unit around the rim.

Another chain conveyor then picks up the tire and wheel assembly to convey it to the inflating machine. Tires are inflated under the bead. This machine travels about four feet during its cycle which carries it over three limit switches. The first switch is for low air pressure; the second turns on the high pressure; and the third unloads the assembly to the chain conveyor. It then passes to a gravity roller conveyor which takes the assembly to the overhead conveyor pickup point.

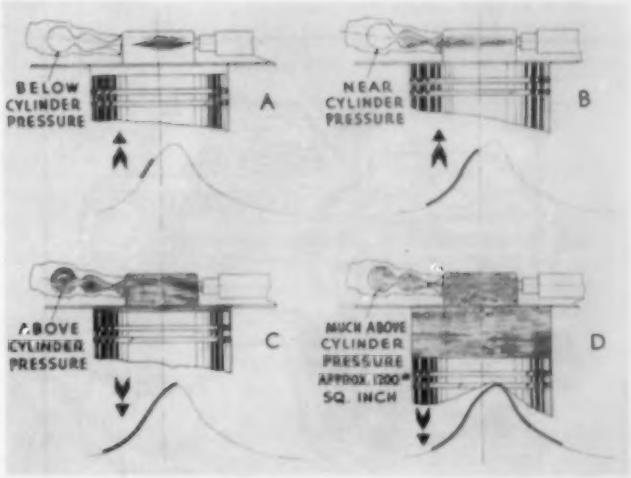


Continental V-8 Diesel



Transverse sectional view of Continental V-8 Diesel

New Diesel *and* Gas Turbine Developments

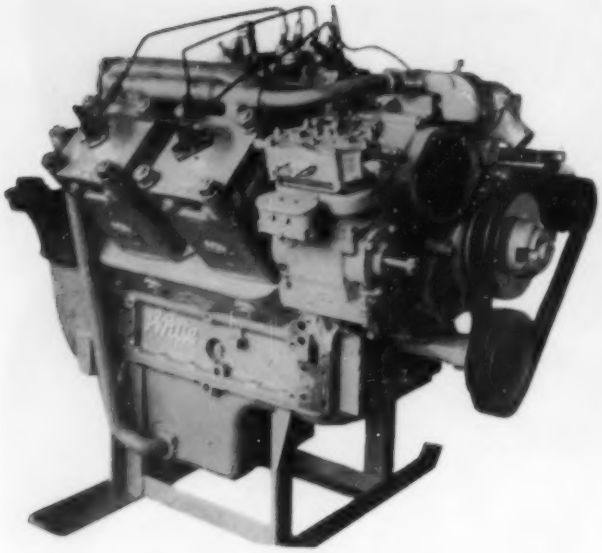


Continental open type combustion chamber with shock absorbing means on the side. Graph shows indicator card. Pressure controlled time delay of the energy cell cushions the power, permits lightweight structure.

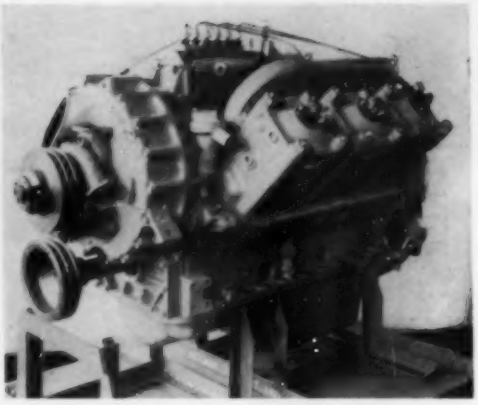
DETAILS of the design of several new engines were presented at the recent Diesel Engine Meeting of the Society of Automotive Engineers. At the SAE Transportation Meeting some features of the differential gas turbine were brought out. This article highlights features of these engine developments.

A V-8 Diesel was designed to shoehorn more equipment into less space, reported E. C. Ginn of Continental Motors Corp. Keeping weight low suggested a wide speed range and low cylinder pressures, keeping bulk down suggested the V configuration. The result was a 603-cu in. engine weighing 1525 lb (see AUTOMOTIVE INDUSTRIES, Jan. 1, 1955, p. 48 for similar gasoline engine.) Both heads are identical. Big ends of rods are tin plated. Crankshaft end counterweights are somewhat undersize, and the difference in balance is made up in the front pulley and a stamped plate attached to the flywheel. This design shortened the engine by $1\frac{3}{4}$ in. and saved about 35 lb in weight. Lightening holes are drilled in the rod journals.

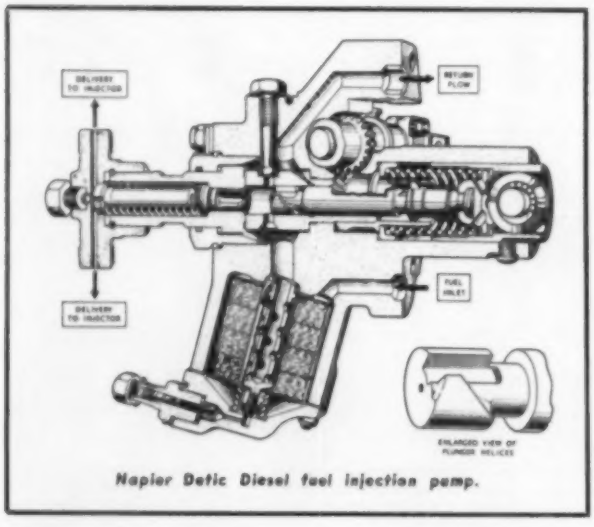
All oil holes are drilled. A pressure differential bypass insures flow to the bearings even if oil in the cooler is congealed. Oil to the overheads is metered through the intermediate cam journals and, by registering once every other engine revolution, ad-



White V-4 Diesel



White V-6 Diesel



Napier Deltic Diesel fuel injection pump.

mits oil to the hollow rocker shaft. This method restricts the flow of oil but permits application of full engine pressure to large passages and avoids plugging of restriction otherwise necessary to reduce total flow.

Ninety-degree V-4 and V-6 two-cycle loop scavenged Diesels now being road-tested by White Motor Co. were described by W. F. Burrows and H. W. Hanners. The design is based on Krauss-Maffei and Schnuerle patents, modified to simplify the arrangement. Installed, the four-cyl engine fits well down between the frame members. It has 5⅛-in. bore and stroke, giving a piston speed of 1879 fpm at 2200 rpm. At 170 bhp for the four-cyl engine the bmep is 72 psi.

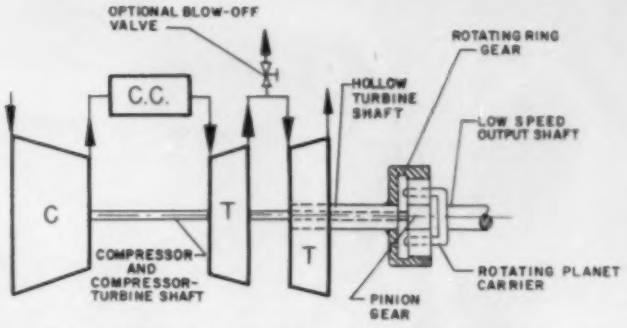
The 'four' has a 155-lb crankshaft with three 4-in. main journals and 3-in. crankpins. Precision bearing shells are used for both, with thrust washers at the center main bearing. The crankcase is a single casting, with water inlet manifolds cast in. Each cylinder is a separate casting with integral water jacket. Rubber O-rings seal the water passage joints. There are three exhaust ports flanked by three air inlet ports on each side.

Aluminum castings give a 170-hp four-cyl engine of 1090 lb, while the cast iron version weighs 1355 lb. For a 255-hp 'six,' corresponding weights are 1530 and 1900 lb, with normal accessories except clutch.

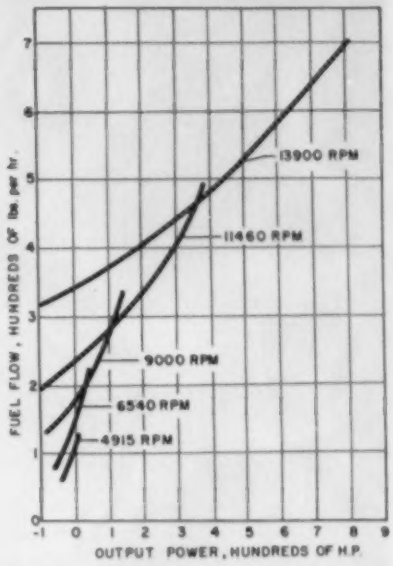
The British Deltic Diesel engine for Naval and commercial use consists of three opposed piston engines in a triangle, with common crankshafts at each corner. Ernest Chatterton of D. Napier & Son, Ltd., described its features as efficient "end to end" scavenging, generous port areas and large passages. There is no valve gear, and no cylinder head sealing problem. Combustion chamber walls are largely hot piston crowns. The 18-cyl Naval version runs 1000 hrs or more between overhauls. The stripped engine at 8860 lb will produce 2730 bhp, with bmep of 100.4 psi and piston speed of 2416 fpm. Bore is 5¼, stroke 7½ in.; speed is 2000 rpm or 1500 rpm derated. Minimum speed of this version of the engine is 450 rpm.

The crankshafts have seven main bearings of thin-wall lead bronze, carried directly in the light alloy crankcases. The three cylinder blocks are clamped by through bolts. Triple seal type rubber rings are provided for coolant seals.

Cylinder liners are chrome plated machined forgings. Inlet parts impart tangential swirl to incoming air. Connecting rods, one plain and one forked, both run on hardened surfaces, as the bearing for the

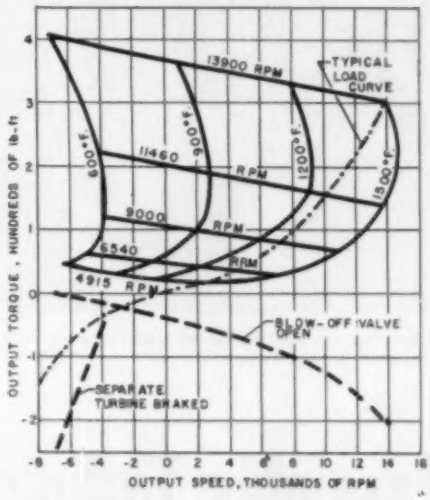


Schematic illustration of two-turbine differential powerplant.



Fuel consumption of two-turbine differential powerplant. This scheme saves up to 50 per cent at the same compressor speeds and output powers, up to 30 per cent at same torques and output powers, up to 60 per cent at idle.

Torque - speed characteristics of two - turbine differential powerplant, showing how it provides increasing output torque with decreasing turbine inlet temperatures as output speed is reduced. Conventional t-t provides larger output torques at low speeds. Low torque at high speed can be provided by overrunning clutch, or with blow-off.



forked rod is housed in a steel shell hardened on the outside.

Two-piece pistons have a connecting space partly filled with oil, to conduct heat.

Both 18-cyl and 6-cyl versions have equally spaced firing. The larger commercial engine is started by air into one bank, the Naval engine by a Cordite cartridge. Turbo-supercharging and compounding are natural possibilities for this engine, reported the author.

Improved torque and efficiency from a gas turbine is possible over the wide speed range required for road vehicles. D. W. Hutchinson of Turbex Corp. said differential gearing is the answer. Applied to a two-turbine engine, this concept means the second turbine is mounted on a hollow shaft surrounding the compressor-first turbine shaft extension. A differential connects the compressor and turbine shafts to each other and to the output shaft. This allows the output turbine to help accelerate the compressor at low output speeds. It provides an effective compromise between the good torque-speed characteristics of the conventional two-turbine machine and the better low-speed fuel economy and faster acceleration characteristics of the basic differential design. The compressor turbines provides only half the power needed to drive the compressor at maximum speed and turbine inlet temperature. Minimum compressor speed for the differential setup studied was about one-half that of a basic two-turbine unit, enabling the new powerplant to operate at lower output torques at low speed. Result is to allow operation along a road-load curve anywhere between 16 and 100 per cent of maximum output speed, compared to 50 to 100 per cent for a conventional two-turbine machine.

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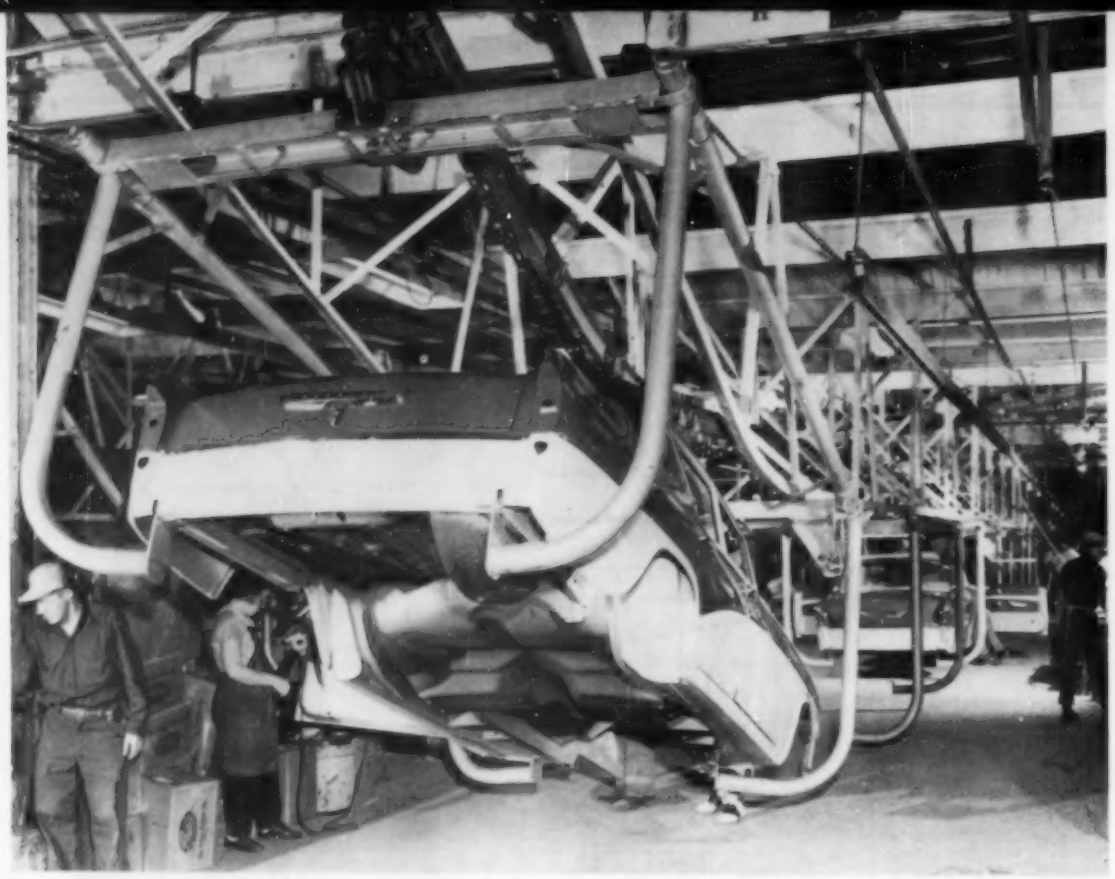
Satellite Work in Progress

The Navy has announced that General Electric Co. will build the rocket motor for the first stage of the composite rocket that will shoot the initial earth satellite out into space. Glenn L. Martin Co. was awarded the prime contract for the rocket launching vehicle. Additional components are to be provided by other concerns.

Launching of the satellite is tentatively scheduled to take place between July, 1957, and December, 1958. Although it is a joint effort of the three military departments, the Navy is managing the program.



Rambler bodies are seen coming from the upper floor paint shop, transported on the monorail while held in the massive carrier, dipping here to meet the final assembly line.

Special Assembly Techniques for

By Joseph Geschelin

STILL alone in the industry in the exploitation of unitized bodies, American Motors Corp. has been advancing the art progressively not only from the standpoint of styling and body design but in the simplification of final assembly line techniques, incident to this type of design. For 1956 the use of coil springs both front and rear, together with torque tube drive, has been extended to all cars in production—Nash, Hudson, and the new line of Ramblers.

With the start of production for 1956, the Kenosha final assembly lines were completely changed, introducing new conveyor systems for Nash and Hudson cars, and an entirely new assembly line specifically for Ramblers. This brief article is concerned with highlights of the Rambler assembly line, although both lines are quite similar in basic concept, differing only in certain details.

Rambler bodies are built in Kenosha and are transported by conveyor from the third floor of the body paint and trim shop to the final car assembly line described here. Attention is drawn to the fact that Rambler bodies are delivered complete with rear deck lid and front fenders, making the hood the only sheet metal item requiring attachment on the assembly line. As illustrated, bodies come in on the monorail while held in the massive four-arm cradle to facilitate handling.

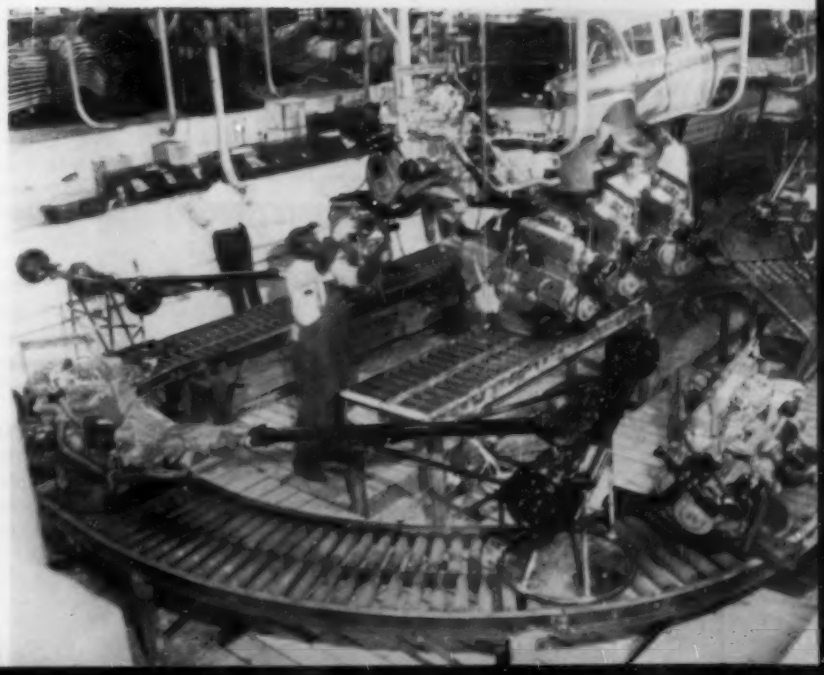
Starting with the entry of the body on the assembly line, installation is made of numerous parts, including steering gear, wiring harness, and heater. Bodies progress until they are moving over the long pit where installation is made of gas lines, gas tank, rear suspension, and rear bumper. Near the end of this section, the front suspension—without coil springs—is attached to the sill on each side.

By this time the conveyor has reached the end of the pit and approaches a wide, open area, illustrated

Nearing the end of the final assembly line, Rambler bodies fitted with wheels and tires ride the flush conveyor. At the point seen here the body carrier is automatically released and moves upward on the monorail for return to the paint shop.

Bodies of Unitized Type

Below is a perspective on the gravity loop area below the Rambler assembly line. Engines are delivered by hoist and lowered as shown. Then the operators attach the torque tube and rear axle drive line to the engine, ready for installation on a Rambler car.



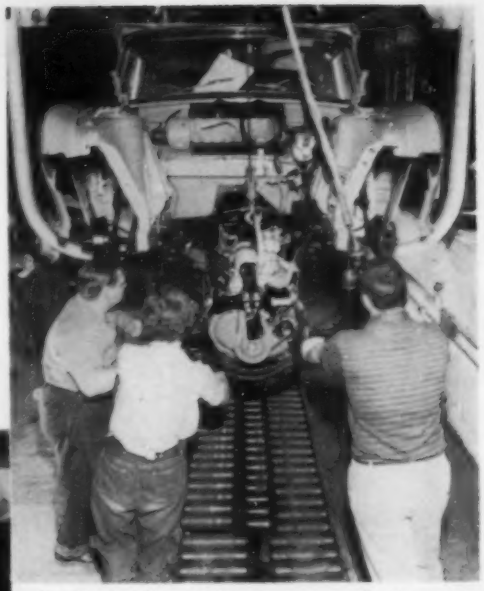
here, containing a gravity conveyor loop for holding powerplant assemblies. These come in on an overhead conveyor and are lowered to the gravity conveyor, near the floor, by means of a hoist. Powerplants then are transported by means of another hoist to the body and are hoisted upward into the front compartment. At this stage the powerplant carries both front and rear support cross members and these are fastened to the underbody.

The rear axle and torque tube assembly is installed at the same position to facilitate the connection of the entire drive line. Before the assembly line makes the bend to the adjacent parallel sec-

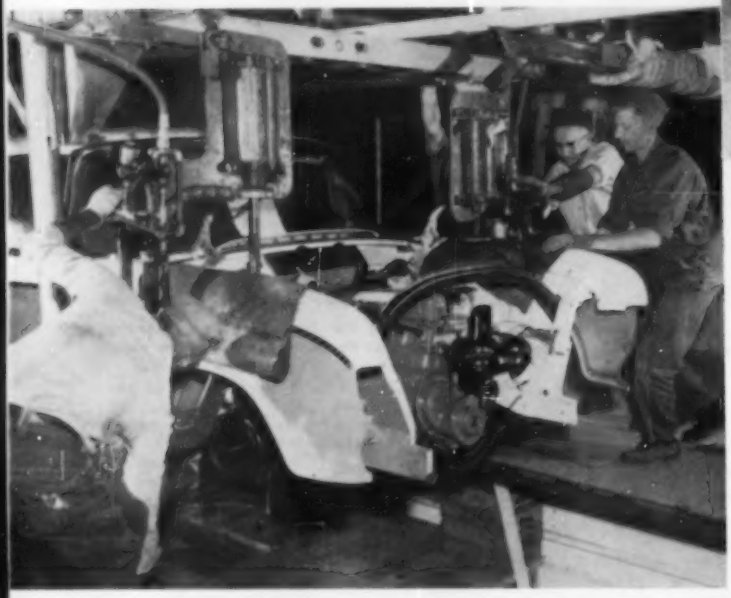
tion of the final line, operators attach the steering linkage and fasten the upper cross member connecting the top sections of the front fenders.

The line then makes a 180-deg turn to traverse the second section and bodies then begin to be fitted with mufflers, tailpipes, shock absorbers, and other details. Now the bodies pass the special fixtures on each side of the line, as illustrated. Front coil springs have been fully compressed on arbor presses to one side of the line and held closed by special clamps. They are installed by the operators, then the fixtures are employed for removing the clamps, thus permitting the springs to open into the front suspension assembly.

Next comes installation of the front grille and headlamps, front bumper, and other parts. This carries the line to the point of entry into the booth built over the line for spraying of undercoating. Upon emerging from this booth, bodies pass the wheel chutes on each side of the line and the wheels are attached at this point.

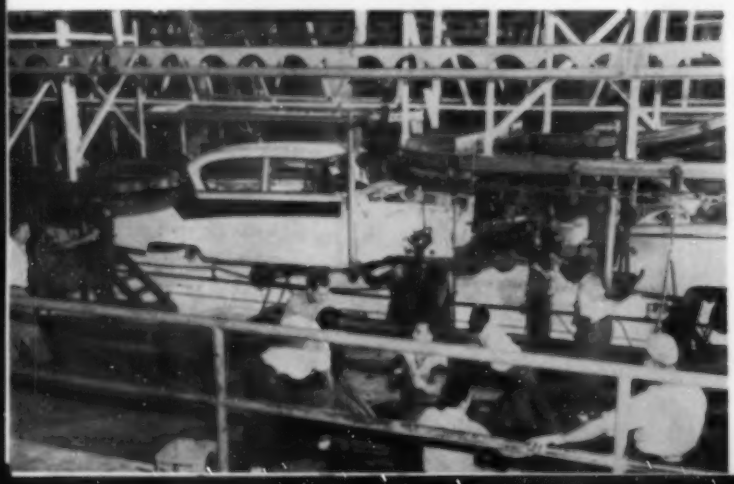


As the Rambler body moves over the area seen here, the engine is hoisted upward into the front compartment. The front cross member is attached securely at this end while the rear axle is attached at the rear end.



This is the section along the final assembly line where the front coil spring is installed and decompressed by means of the special fixtures seen on each side of the car.

View on the Hudson and Nash final assembly line, showing installation of the engine and drive line assembly.



As the wheels are mounted the car becomes mobile and is lowered to make contact with flush conveyor line. At this point the four-arm carrier becomes detached and moves out of the way on the return loop of the monorail for transport to the body storage lines.

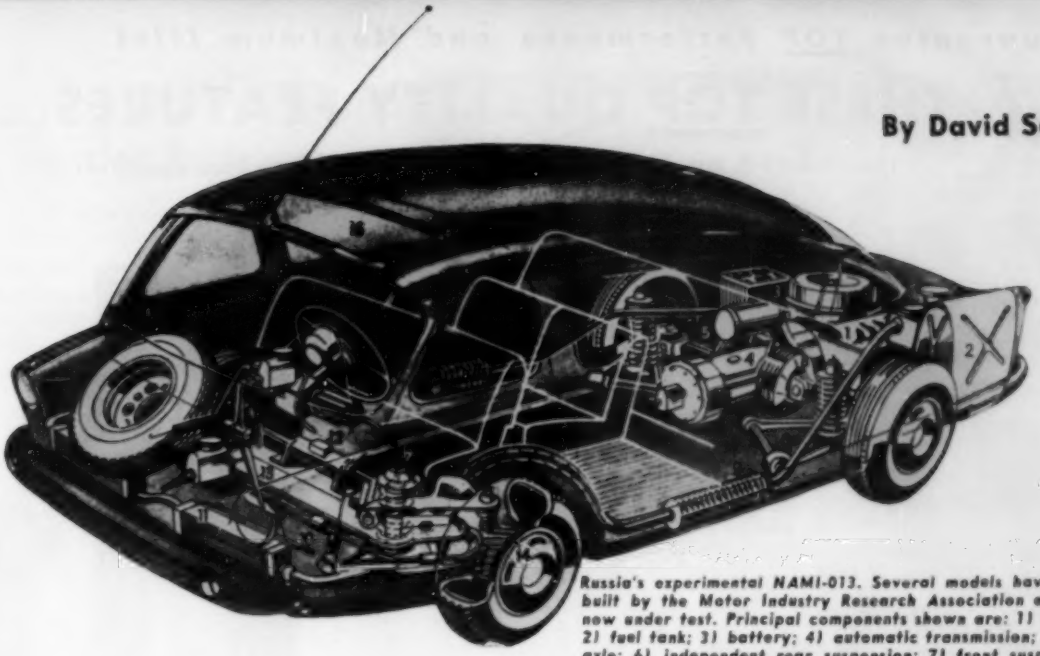
Moving on their own wheels, the cars now approach the end of final assembly, receiving such items as batteries, air cleaners, hoods, floor mats, etc., required to complete the car.

As cars move to the end of the line, the fuel tanks are filled and each car is ready to drive off the line under its own power. As is customary, this is followed by running on drive rolls, front wheel alignment, and headlamp aiming.

As mentioned earlier, the Hudson and Nash final lines are quite similar in operation. However, there are some basic differences. For one thing, bodies for these lines come in from Milwaukee, are

(*Turn to page* 132, *please*)

By David Scott



Russia's experimental NAMI-013. Several models have been built by the Motor Industry Research Association and are now under test. Principal components shown are: 1) engine; 2) fuel tank; 3) battery; 4) automatic transmission; 5) half axle; 6) independent rear suspension; 7) front suspension; 8) inboard rear brakes and universal joint; 9) hot water heater for car interior; 10) radiator shutter for temperature control; 11) twin radiators for engine cooling; 12) power steering; 13) single pedal control (brake up, gas down); 14) finned brake drum; 15) wrap-over door; 16) tinted roof window.

Russian Engineers Inspect British Automobile Plants

LONDON, ENGLAND

For the first time since the war the British motor industry has opened its doors to a delegation from its Soviet counterpart. Three of Russia's leading automotive engineers spent over three weeks in England, arriving for the London Motor Show in October and then touring the main industrial centers. Under the auspices of Britain's Society of Motor Manufacturers and Traders they visited the factories of Vauxhall (GM), Ford Standard, Daimler, A.E.C., Park Royal, Commer, Austin, and Rover—and were even given a chance to drive the Rover gas turbine car. The group comprised A. M. Kriger, Chief Designer of the Stalin Auto Works; S. B. Chistozvonov, head of the engine division of Russia's Motor Industry Research Association (NAMI); and P. V. Nagayev, research specialist at NAMI.

In an exclusive interview, Mr. Kriger, the delegation leader, stated that the reception was "very wonderful everywhere," and that he was impressed by the organization, layout and scheduling systems of the larger plants he saw.

He indicated that the Soviet industry compared favorably with that of Britain, but was "probably" not as advanced as in America. Automation was widely used in Russia, though it was not universal. At the Stalin works (ZIS), which makes trucks and cars, there were transfer lines for cylinder blocks, flywheel housings and transfer cases.

His government "understands perfectly" the importance of automatic production equipment, and is giving it top priority under current planning. He cited the automatic piston factory as an outstanding example of this. Daily output is 3500 completed pistons with only nine workers on each of the three shifts. The automatic sequence covers melting the aluminum alloy ingots, casting, heat treatment, machining, balancing, plating, washing, inspection, greasing, and packaging in matched sets.

Another exceptional installation he mentioned is a plant for making ball and roller bearings. About 40 chucking automatics for successive machining of the inner and outer races are linked together by overhead gravity chutes and elevators. Loading and unloading of the machines is automatic, as are inspection and final assembly with the balls and cages. Production was stated at about 1.5 million races per yr.

Mr. Kriger said that Russia's policy of design standardization — mass-producing a strictly limited variety of end-products—lent itself to the greatest use of automation, since virtually unbroken runs of the same component justified the high initial cost of the equipment. The machine tool industry was therefore

(*Turn to page 73, please*)

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(Standard on Miller Cylinders at no extra cost)

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CASE-HARDENED Piston Rods (52-54 Rockwell "C") provide practically complete protection against damage from hammer blows, wrench-dropping, mishandling, and similar occurrences. ***Available from Miller at no extra cost.***

The HARD CHROME PLATING over the case-hardened rods protects against scratch-damage and rust. ***Available from Miller at no extra cost.***

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On all Air and Hydraulic Cylinders

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On all Hydraulic Cylinders

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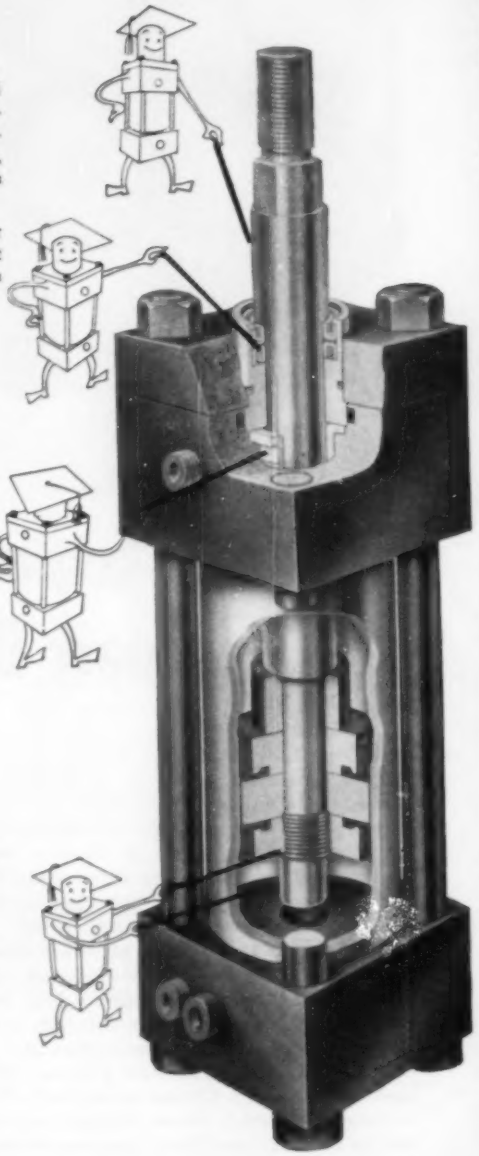
Cylinder heads, caps, mountings, pistons, followers, tie rods, and the unplated portions of the piston rods have this finish ***at no extra cost on all Miller cylinders.*** (This finish not recommended for water service)



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AIR & HYDRAULIC CYLINDERS • BOOSTERS • ACCUMULATORS
COUNTERBALANCE CYLINDERS

Russian Engineers

(*Continued from page* 71)

stepping up its output of suitable machinery, and seeking to develop a number of universal drilling and milling heads as basic units for transfer lines. At the same time it was working on individual multi-station automatics which could be coupled by appropriate conveyors and loading devices. His own ZIS plant, in fact, is now installing new equipment of these types, and intends to double output with the same floor area.

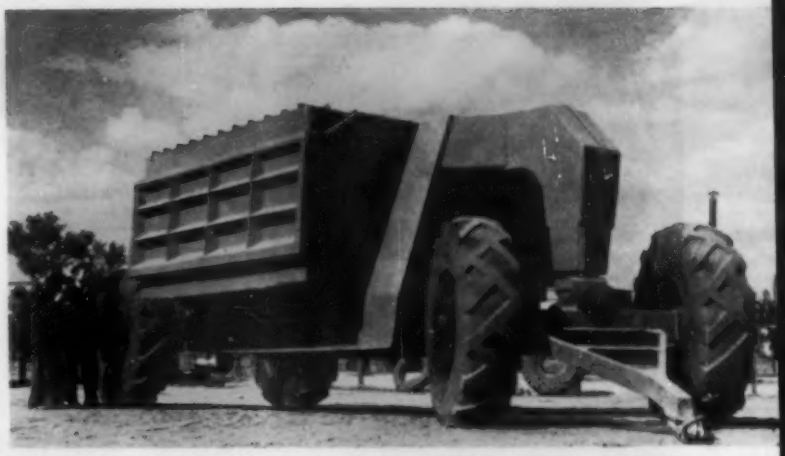
According to Mr. Kriger, there is no worker-resistance to automation, "since the Soviet Union is a very big country and there is plenty of work for everyone." Wages are on a piece-rate basis with a complicated differential for automation, and workers on this equipment may earn as much as a third more than those on manually operated machines. There is equal pay for women, who make up some 40 per cent of the ZIS payroll.

On design questions, he emphasized that the Russian approach is to make trucks as simple and rugged as possible. Accessiblity and ease of repair are first considerations, for in the USSR distances are great and garages infrequent, and driver-mechanics often have to cope with breakdowns on their own. For this reason, cab-over-engine construction and unitized sub-assemblies are not used. Standard engines and chassis components common to a number of vehicles also simplify the problem of distribution and stocking of spare parts throughout the country.

Side-valve engines are usual, Mr. Kriger explained, because of the low octane number of much of the gasoline at present available. This mostly has a rating of only 66, although in some urban centers 70 and 74 can be had in limited quantities. When supplies of higher octane fuel improve, overhead valve engines will be introduced.

Greater flexibility of design is now being given to passenger cars, however, and several new models

(*Turn to page* 118, *please*)



Ruggedly-built trailer with 15-ton payload capacity incorporates a hydraulic system with rams for two-way dumping.

Designed for bulk transport of agricultural goods, this articulated six-wheeler has a side-dumping body with split loading doors. Capacity is stated to be four tons of cotton or six tons of denser produce. The KAZ-120 tractor, and KAZ-716 semi-trailer are built at the Kutaisi Automobile Works.

DT-57 crawler, made at Stalingrad, is designed for bi-directional work in mountainous districts. An auxiliary transfer box makes possible the use of the full gear range in both forward and reverse, and there are two driver's seats facing the common controls.

CUSTOMER SPECIFIED
Color indicates machined surfaces
A leading automotive manufacturer recently specified a multi-purpose production machine to perform a combination of rough and finish milling, horizontal and vertical drilling operations. Specifications called for a single machine that would do all these operations with increased efficiency and lower production costs.
Feed Slide Unit
Quill Feed Unit
Rotary Index Table
Lead Screw Tapping Unit
Way-Type Drill Unit

Kearney & Trecker offers you standard

Illustrated here are several standard units which Kearney & Trecker incorporates in automatic production machines that perform a combination or series of drilling, milling, boring and tapping operations to exacting accuracies.

Kearney & Trecker combines these standard design units with a minimum of special engineering to keep production machine costs at a minimum. What's more, you get increased production at lower cost and higher efficiency. Such utilization of standard units provides the economies you want, from job-proven designs with minimum of capital investment.

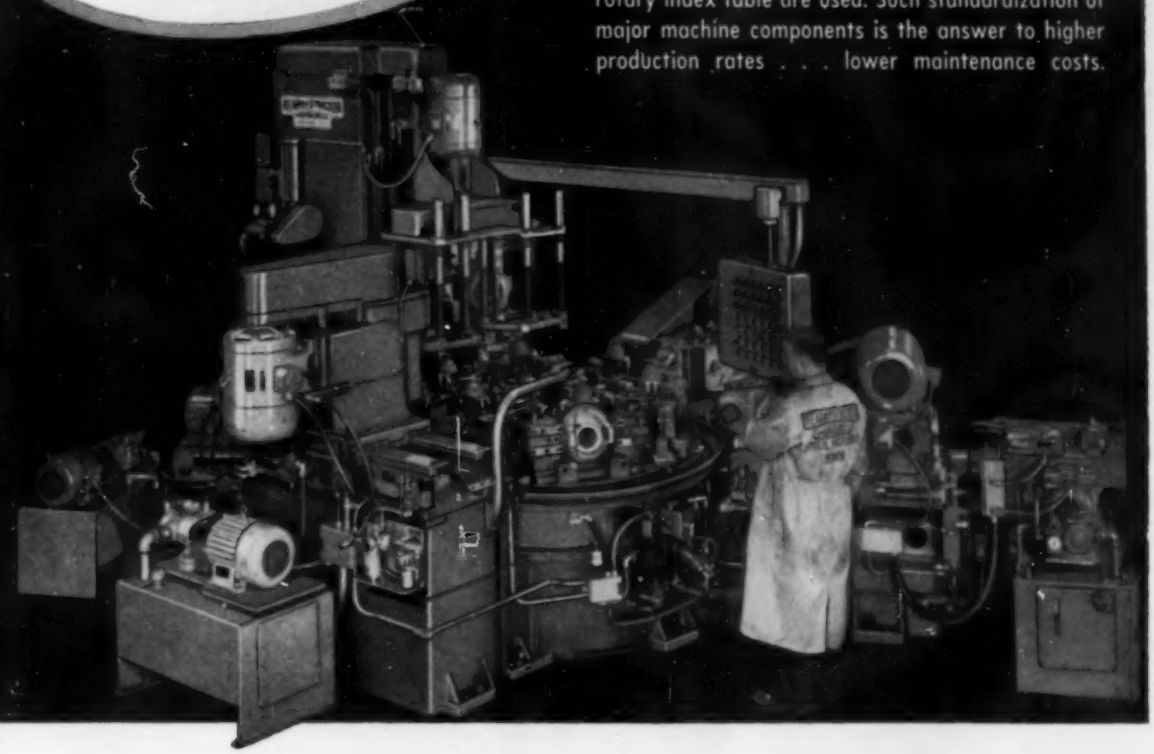
Standard Feed Slide Unit — One of the most important developments, the Model B Feed Slide provides hydraulic feed for milling, boring or drilling heads. Available in four sizes (determined by width of ways), and each size in four different length cylinder strokes. A variety of feed cycles is possible — single, fine and coarse, single skip, double skip and feed return. (Data Sheet No. 1019a.)

Standard Quill Feed Unit — Simplifies and speeds production of machines which perform drilling, boring, reaming, counterboring and chamfering operations. There's 10″ stroke and a spindle speed range of 200-1690 rpm, which is variable by change gears and sheave diameters. Single or multi-spindle arrangements are possible as well as single or double feed rates. (Data Sheet No. 1055.)

Standard Rotary Index Table — Designed especially for production machines, the Rotary Index Table is a rugged, accurate, self-contained unit for mounting various work-holding fixtures. Unit is available in four

KEARNEY & TRECKER MILWAUKEE DESIGNED

Kearney & Trecker designed and built this 6-Station Rotary Indexing machine — incorporating nine standard units — to perform a series of milling and drilling operations on rear axle differential carriers at the rate of 82 pieces per hour. Five feed slides, one quill feed unit, two drill power units, and a rotary index table are used. Such standardization of major machine components is the answer to higher production rates . . . lower maintenance costs.



units for lower production machine costs

different table diameters — 36", 48", 60" and 80". (Data Sheet No. 1018a.)

Standard Way-Type Drill Unit — Designed for drilling, boring, reaming, counterboring and chamfering operations with heavy cutting loads. Entire unit can be mounted at any angle on a production machine. Single or multiple-spindle arrangements as well as single or double feed rates are possible. Completely self-contained spindle head has a speed range of 98-1691 rpm, with 72 increments . . . feed range of 1-16 ipm . . . 140 ipm rapid advance and 260 ipm rapid return. (Data Sheet No. 1075.)

Standard Tapping Unit — This compact, self-contained unit can be arranged to tap any thread from ¼" to 1" in diameter in both national coarse and fine series, in addition to six sizes of pipe taps. Spindle speeds range from 80-280 rpm with a choice of three motors, 1, 2 or 3 hp. Single as well as multi-spindle arrangements are possible. (Data Sheet No. 1074.)

For more complete information on standard units, ask for Data Sheets listed under each unit; for details on the 6-Station Rotary Indexing machine, utilizing nine standard components, request Data Sheet No. 1076. See our nearest representative, or write Kearney and Trecker Corp.

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People sometimes find it hard to believe us when we tell them that parts like these can be made from metal powder in one press operation. Then they're amazed to see us make these and other equally complicated parts easily, economically, in quantity. And when they learn about the over-all advantages — *Improved product performance . . . Lower unit cost . . . Dependable, on-time quantity delivery . . . Engineering assistance . . . Savings in customer investment in equipment and floor space* — they are convinced that Moraine engineering and metal powder techniques may offer real solutions to their own problems.

Moraine products include: Moraine-400 bearings, toughest automotive engine bearings ever made— Moraine friction materials — Moraine metal powder parts — M-100 engine bearings and Moraine conventional engine bearings — Self-lubricating bearings — Moraine porous metal parts — Moraine power brakes — Delco hydraulic brake fluids — Delco master cylinders, wheel cylinders, lined brake shoes and parts.

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By cold heading and special production methods, National can turn out many special headed-and-threaded fasteners which, like these bolts, solve special problems or reduce costs. Depend on National's extensive manufacturing facilities and complete line of fasteners for your needs.

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Never a shutdown to oil this Welsh Plug machine because Farval's on the job

FARVAL—
Studies in Centralized Lubrication
No. 175

THIS machine drives seven Welsh Plugs into the block of a well-known automobile engine. Uninterrupted operation is essential to its smooth performance as part of the automated line.

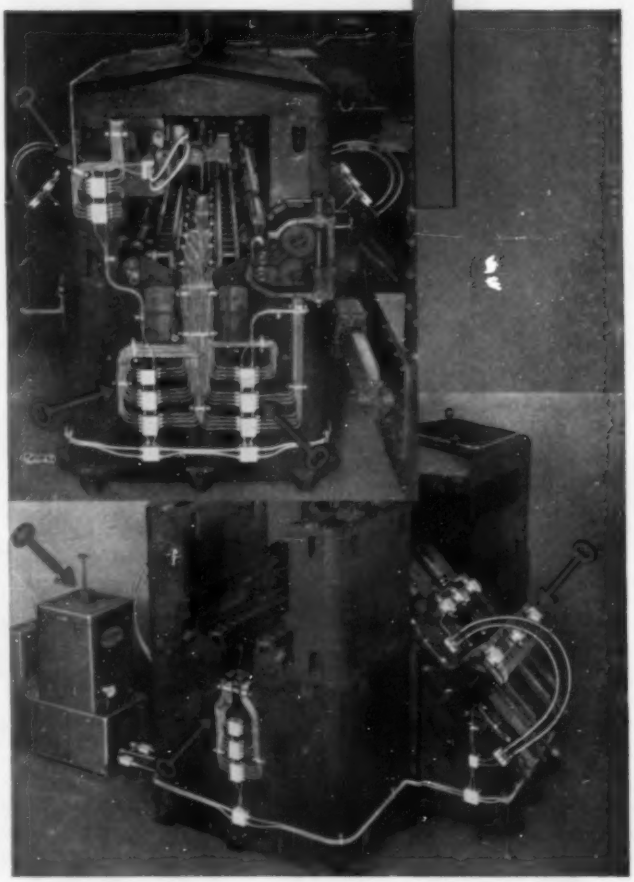
That's the reason the builder installed Farval Centralized Lubrication. These photographs were taken before final assembly of the machine, to show the extensive, orderly arrangement of Farval lubricant lines and valve manifolds serving 207 vital bearings—failure of any one of which would cripple the operation.

Now in service, the Farval system lubricates the machine automatically from the pumping station located at the left. It delivers a measured amount of oil to each bearing, as often as desired, while the machine itself is operating. Never a shutdown for lubrication! And no special oiler is needed.

Farval Automatic Lubrication is the ideal system for automation in any industry. The Farval Dualine valve placed at each bearing is simple, sure and foolproof—only two moving parts, without springs, ball-checks or pinhole ports to cause trouble. Its value proved by more than 27 years of successful service, Farval lubricates millions of industrial bearings.

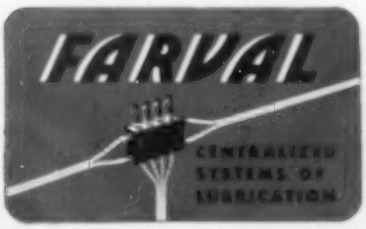
Let us send one of our lubrication engineers to analyze your plant equipment and help you determine how Farval can serve you. Just drop us a line. Ask also for Bulletin 26. The Farval Corporation, 3296 East 80th Street, Cleveland 4, Ohio.

Affiliate of The Cleveland Worm & Gear Company, Industrial Worm Gearing. In Canada: Peacock Brothers Limited.



KEYS TO ADEQUATE LUBRICATION — Wherever you see the sign of Farval—the familiar central pumping station, dual lubricant lines and valve manifolds—you know a machine is being properly lubricated.

These photographs of a Welsh Plug Assembly Machine, showing Farval lines and valves on both sides, by courtesy of the builder, Sainte Claire Tool Company, Detroit, Michigan.



News of the MACHINERY INDUSTRIES

By Thomas Mac New

New Machine Tool Orders Went to $103.4 Million During October, the Highest Total Since July, 1952.

Machinery Exports

A recent report from the Machinery and Allied Products Institute points out that from 1950 through 1954 the United States' share of the world market for capital goods declined from about 50 per cent of the total to a little less than 39 per cent. According to 1954 machinery export trade statistics published by the Organization for European Economic Cooperation, world-wide exports of machinery and equipment by major capital goods-producing countries increased to $7362 million in 1954, two per cent above the previous year but 10 per cent below the record year of 1952.

Although the proportion of total world export trade in machinery and equipment accounted for by the U. S. continued to decline in 1954, the rate of decline has slowed considerably. West Germany, on the other hand, has made such rapid gains that it now challenges the United Kingdom for the second position.

Some of the U. S. export losses have been made up, however, by U. S. manufacturers foreign subsidiaries. MAPI believes that the decline in U. S. exports somewhat overstates the drop in competitive standing of U. S. capital goods producers.

Tooling Climbs to Highest Peak Since Mid '52

Just recently the National Machine Tool Builders Association announced that new orders for October, the month following the Machine Tool Show, totaled $103.4 million, the highest total since July of 1952. Up to October, the 1955 monthly average for new orders ranged in the $60 million category; and the 1954

(*Turn to page* 140, *please*)

Machining Tests (dry) with Ceramic Cutting Tools

Workpiece Material	Speed (fpm)	Linear Feed (in. per rev.)	Depth of Cut (inches)	Tool Travel Up to Regrind (inches)
Brass	650	0.010	0.125	88
Cast Iron	300	0.010	0.125	70
SAE 4140	300	0.010	0.125	76
SAE 4140	250	0.008	0.125	104
SAE 4140	600	0.008	0.100	102
SAE 4140	950	0.008	0.125	106
SAE 4140*	910	0.012	0.250	88
SAE 4140	1200	0.012	0.125	120

* Heat treated to 390 Brinell.

TABLE I—MACHINERY EXPORTS

Total Machinery Exports To World Market Areas By Major Machinery Exporting Countries

1952-1954 (millions of dollars)

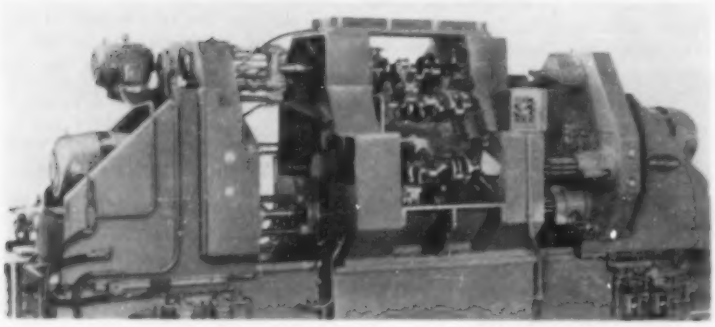
Exporting Country		Canada			Central America			South America			West Europe			Other Areas[3]			World Exports		
		Non-Electrical Machinery	Electrical Machinery	Total	Non-Electrical Machinery	Electrical Machinery	Total	Non-Electrical Machinery	Electrical Machinery	Total	Non-Electrical Machinery	Electrical Machinery	Total	Non-Electrical Machinery	Electrical Machinery	Total	Non-Electrical Machinery	Electrical Machinery	Total
United States	1952	592.0	133.6	726.5	216.6	85.5	302.1	411.9	120.2	532.1	456.0	87.5	542.5	1570.1	282.0	1630.1	3254.6	679.1	3933.9
	1953	638.0	184.8	822.8	231.6	72.9	304.4	384.6	119.1	483.7	448.0	85.8	531.8	1480.5	389.6	1870.1	2128.8	852.5	2981.3
	1954	482.3	149.6	631.9	196.4	56.6	253.0	394.8	108.7	501.5	372.3	70.1	442.4	602.4	417.0	1019.4	2048.2	800.0	2848.2
Canada	1952				9.5	3.8	13.3	22.4	14.8	37.2	71.3	7.0	18.3	132.5	22.9	155.4	175.2	48.6	223.8
	1953				5.7	2.2	7.9	17.7	7.1	24.7	8.1	11.3	19.4	187.4	28.5	133.9	138.6	47.1	185.7
	1954				7.6	1.6	9.1	18.6	8.0	26.5	18.7	3.2	19.9	112.1	20.8	132.9	164.7	33.5	198.2
Benelux Countries[1]	1952	1.0	0.8	1.8	0.8	4.8	5.3	11.6	18.7	30.3	85.0	107.7	192.7	52.1	58.4	110.5	150.2	190.4	340.6
	1953	0.8	1.5	2.3	0.9	5.3	6.2	8.4	11.5	19.9	86.0	112.3	200.3	36.2	61.9	118.1	154.3	192.5	346.8
	1954	0.9	2.0	2.9	1.3	5.6	6.9	6.4	19.3	25.7	96.5	131.6	228.1	56.1	65.9	121.1	163.2	221.5	384.7
France	1952	0.8	*	0.9	4.2	0.6	4.8	27.8	5.1	32.6	104.8	32.9	137.7	155.8	92.7	248.1	293.3	131.6	424.9
	1953	0.7	0.1	0.8	2.2	0.6	2.8	42.3	7.9	50.2	97.3	31.0	128.3	123.8	76.0	199.6	266.2	115.8	382.0
	1954	0.6	0.1	0.7	2.3	0.6	2.9	38.9	9.3	48.3	88.5	46.0	134.5	123.2	80.4	203.6	253.6	136.4	390.0
West Germany	1952	4.9	0.3	5.2	10.8	3.1	14.0	108.4	28.4	136.8	606.3	102.4	708.7	144.4	48.4	189.8	875.2	239.8	1115.0
	1953	5.9	0.4	6.3	19.2	5.0	24.2	95.4	34.8	130.2	651.6	177.1	828.7	199.8	54.4	253.9	967.9	275.7	1243.6
	1954	7.8	1.0	8.8	16.9	5.1	22.0	100.2	57.6	157.8	700.3	223.6	923.9	212.9	79.4	292.3	1043.1	366.7	1409.8
Italy (Including Trieste)	1952	1.4	*	1.5	2.8	0.8	3.6	29.3	6.6	35.9	61.4	39.7	102.1	56.9	6.8	62.7	171.1	35.1	206.2
	1953	1.4	*	1.5	5.8	1.6	7.4	32.9	9.6	42.5	64.2	20.3	84.5	43.8	7.2	51.0	148.4	38.9	187.3
	1954	1.0	*	1.0	5.8	1.6	8.4	36.5	6.2	42.7	59.3	22.0	81.9	45.1	8.6	53.7	148.7	39.0	187.7
Scandinavia[2]	1953	4.3	0.5	4.8	2.0	2.8	4.8	20.4	13.4	41.6	138.9	39.8	178.7	62.6	30.2	92.8	236.2	86.7	322.9
	1953	4.1	0.3	4.4	2.8	5.6	8.4	26.1	11.1	37.2	133.3	42.4	175.7	56.3	16.9	72.2	221.6	76.3	297.9
	1954	4.3	0.9	5.2	3.5	5.9	9.4	33.7	15.2	48.9	149.5	48.2	197.7	83.8	10.5	73.6	244.5	90.0	334.8
United Kingdom	1952	48.2	21.6	67.8	9.5	3.3	12.8	83.1	27.9	111.0	371.4	110.2	481.6	606.3	320.0	946.9	1118.4	905.4	1023.5
	1953	60.3	24.0	84.3	11.2	2.4	13.6	61.2	16.9	68.2	399.8	102.5	462.4	629.8	326.4	985.2	1111.6	462.4	1594.0
	1954	52.2	23.1	75.3	8.0	2.5	10.5	50.2	19.3	69.5	371.1	112.5	483.6	660.3	319.0	979.3	1141.8	476.4	1618.2
Total	1952	651.6	156.8	808.5	256.0	104.7	360.7	722.6	236.1	957.7	1954.1	586.2	2422.3	2750.3	846.0	3638.3	6274.4	1916.7	8191.1
	1953	711.2	211.2	922.4	280.4	90.6	334.9	630.6	218.0	868.4	1840.3	562.7	2431.1	1699.1	972.9	2672.0	5137.4	2081.2	7218.6
	1954	649.1	176.7	726.8	242.7	79.5	322.2	679.3	241.6	920.9	1880.2	557.0	2517.0	1867.9	1088.0	2875.9	5199.1	2163.5	7361.6

* Less than $50,000.
[1] Comprising Belgium, the Netherlands and Luxemburg.
[2] Comprising Denmark, Norway and Sweden.
[3] Comprising Asia, Africa, Oceania and East Europe.
Source: MAPI.

NEW PRODUCTION and PLANT EQUIPMENT

FOR ADDITIONAL INFORMATION, please use reply card on PAGE 89

Crankshaft Drilling Machine



This trunnion machine with pot-type heads drills, chamfers, reams and taps up to 100 crankshafts per hour. Head lead screw spindles feature quick change nuts. Trunnion has power-operated shop pins. (Michigan Drill Head Co.)

Circle 40 on postcard for more data

Assembles Pinion

A 25-TON press with electrical controls automatically assembles and stakes the drive flange of an automotive transmission to a pinion gear and then assembles a bushing into the gear. The machine is equipped with a special work base, a hydraulic assembly cylinder, hydraulic loader and hopper feed. A spiral bar and nut assembly guides the flange in assembly to the helical spline teeth of the gear.

Tooling includes a helical spline locator, for location of gear in work nest from previously cut teeth, and hardened and ground staking tools mounted on the ram nose piece.

The operator loads a gear in the work nest radially locating from one of the gear teeth. He then loads a flange up over the splined nose piece of the ram, which locates radially from the previously cut internal splines of the flange. The buttons are pushed, starting the machine cycle. The ram descends, pressing the flange over the gear and staking the two together. The ram remains down, holding the work piece until a bushing is assembled from under the work nest up into the gear. A hydraulic cylinder with cross head and guide bar arrangement and interlocked to the machine cycle automatically assembles the bushing into the gear. The bushings are fed continuously by a rotary hopper into a magazine tube feed. A hydraulic loading slide interlocked to the cycle transfers the bushings one at a time into assembly position under the work nest.

After the bushing has been assembled into the work piece the ram returns to up position and the operator unloads the completed part. The complete cycle for assembly of the work piece is about 17 seconds. *American Broach and Machine Co.*

Circle 41 on postcard for more data

Tumbling Media

Two new barrel finishing media have recently been placed on the market. Tumblex "T" consists of Alundum vitrified bonded triangular shaped abrasive. This was developed to overcome the problem of the wedging of abrasive in parts being tumbled. Tumblex "N" is a natural material. This is being used with good results in finishing, and especially die castings where conventional abrasives frequently cut through the outside protective layer of the casting exposing the porous structure beneath.

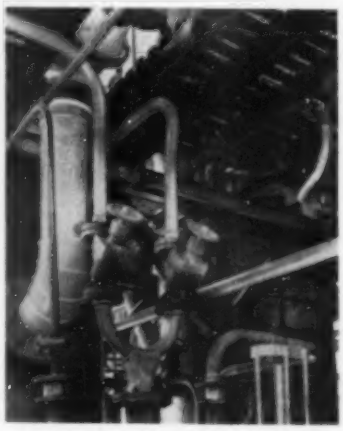
Advantages claimed for the new "T" molded shapes include: Uniform size and shape to prevent wedging; faster cut with no cutting compound required; maximum surface contact between abrasive and work parts; light weight per cubic foot; even wearing and constant shape; chemically inert.

The "N" type is especially suited for use on die-cast items. Because it cuts slower and has little breakdown, it reportedly does not mar the surface. It also brings up a bright color and luster. *Norton Co.*

Circle 42 on postcard for more data

Plastic Pipe

RIGID non-plasticized polyvinyl chloride pipe also suitable for use as a structural material is to be marketed as Ryertex-Omicron PVC pipe. The new type has no additives or fillers, for maximum resistance to attack by various acids, alkalies, salt solutions, alcohols and other chemicals. It will not support combustion. Pipe fittings and valves of the same material will also be available. Pipe can be sawed, threaded, solvent welded and heat welded. It will be supplied in Schedule 40 and Schedule 80 pipe sizes. *Joseph T. Ryerson & Son, Inc.*



Installation of Ryerson PVC pipe

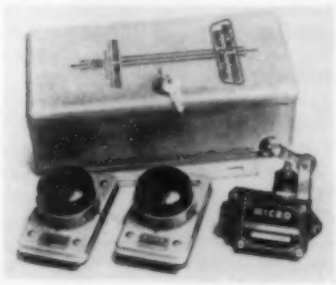
Circle 43 on postcard for more data

Press Control

ELECTRIC two-hand clutch control for industrial machines can increase productivity of manually-operated power machines by as much as 20 per cent, the company said. The system features simple, direct operating motions of the operator; feather-touch, finger-tip operation of the control switches. The system incorporates what the company describes as "fail-safe," "can't-cheat" and "set-up and run" features.

The fail-safe feature makes accidental operation of the clutch impossible. Two sets of contacts close on the actuator load on each operation, and both must be released before the next operation can be performed. A third set of contacts breaks the load, eliminating any danger of sticking contacts. If a component fails or is broken in any position, the control system becomes inoperable.

The system's can't-cheat feature requires operation of all the switches in the control circuit within a predetermined and adjustable time interval. Both hands must be on the controls

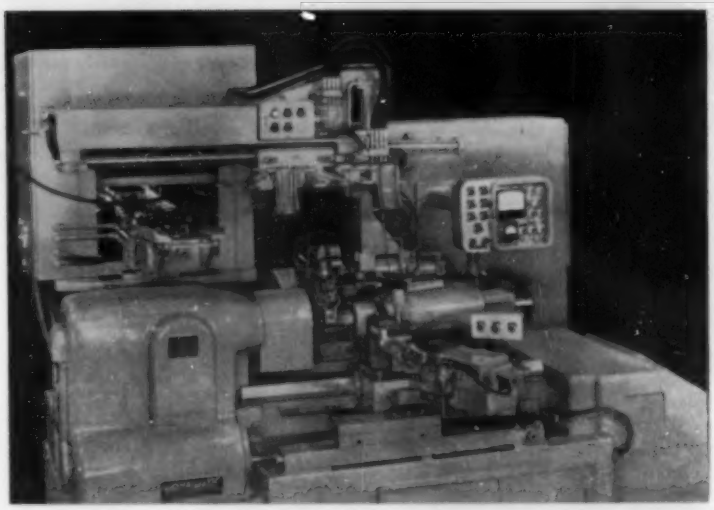


Safety clutch control, the Micro Switch trip control

and thus cannot be extended into the danger area. If an attempt is made to cheat the controls, or the control fails to operate properly, the control circuit instantly trips out. Automatic resetting is accomplished by simply releasing both hand switches or restoring damaged wire or parts to normal.

The system's set-up-and-run feature protects operators, set-up men and dies from an unexpected power stroke during set-up. The motor must be turned off before the clutch can be actuated. The control also prevents the clutch from being engaged on a dead flywheel and an unexpected stroke occurring when the motor is started. *Micro Switch Div. of Minneapolis-Honeywell Regulator Co.*

Circle 44 on postcard for more data



Monarch automatic loading mechanism can be set up to handle workpieces between two or three machines

Automatic Lathe Loader

HYDRAULICALLY-ACTUATED automatic loading mechanism is now available for the recently-announced model 21 Mona-Matic lathe. Incorporating a gravity chute and a shuttle conveyor, the loader automatically positions each piece between the work centers of the machine, triggers the Multicycle programmer controlled four cut automatic work cycle of the lathe, and finally removes each finished piece. No manual control by the operator is required for any portion of this operating sequence, and the loading mechanism and the lathe function continuously as long as a supply of new workpieces is maintained in the loader's conveyor chute.

The lathe is a standard model with an air-operated tailstock unit actuated by the loader control circuit. Special safety switches are incorporated in the tailstock to prevent lathe operation if the workpiece is not properly centered by the loader mechanism. An air-operated chuck is used. *Monarch Machine Tool Co.*

Circle 45 on postcard for more data

Tube Piercer

DOUBLE acting tube piercing units for use in press brakes and punch presses are designed to produce clean, accurately located single or multiple holes in tubular parts. Alignment between upper and lower sections is obtained simply by applying a straight edge to the surfaces of the adapter plates which fit over the tubing in the punch. Since there is no die in the unit, there is no danger of shearing the punches through misalignment. The units can be set up on flat plates for mounting to bolster and ram plates of punch presses. Keyed plates for mounting individually in press brakes can also be furnished. For a series of holes, templates for mounting the desired number of units in the required positions can be supplied.

Capacities of standard units are ½ to one in. O.D. tube; maximum punch diameter 0.312 in., maximum wall thickness of tubing 0.093 in. Special units for larger holes and larger tubing are available. *Wales-Strippit Corp.*

Circle 46 on postcard for more data

Oil Cups

FOR replacement and plant maintenance purposes, the Lubrikit is a conveniently boxed assortment of 95 oil cups of 29 different types. These are the oilers most used for maintenance and replacement throughout industry, as shown conclusively by the company's sales records. Each type of oiler comes in its own separate bin within the kit. Contents of each bin are fully and clearly described on the inside of the cover. *Gits Bros. Mfg. Co.*

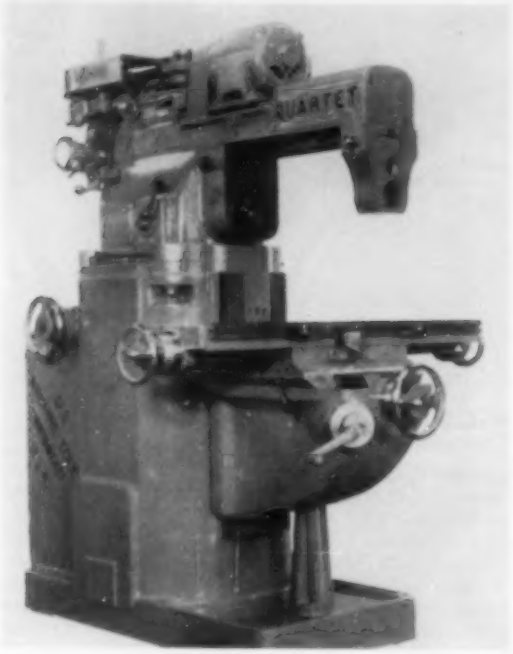
Circle 47 on postcard for more data

Spindle Indexes on Milling Machine

THE horizontal spindle, rather than the saddle and table, indexes for universal operations on a unique milling machine. The spindle is mounted in a turret which may be swiveled 360 deg by means of a worm and worm wheel. When the "Quartet" is used as a universal horizontal miller, the spindle is indexed to the required angle. This feature provides extreme rigidity for precision work. The table retains its inherent stability, and the turret locks at the desired angle. In addition to universal and horizontal operations, the new machine will perform vertical and angular milling operations.

The No. 2 milling machine, weighing 4500 lb, has 30 in. of horizontal travel, 11 in. of cross travel, and 16¼ in. of vertical travel. The horizontal spindle has either a No. 40 or No. 50 taper and is driven by a three or five-hp drive motor. The independently operated power-feed vertical head is driven by a 1½-hp motor.

Rapid traverse powerfeed to the saddle and table is standard equipment. The overarm is positioned through rack and pinion. The machine features infinitely variable horizontal spindle speeds, from 29 to 1450 rpm; both the horizontal and vertical spindles may be used simultaneously, and it will operate while the turret is being indexed. *U. S. Burke Machine Tool Div.*



Designed primarily for maintenance, tool and die shops, and model departments, the machine can mill, drill, bore, tap, face and counterbore a workpiece in one setting, without the use of fixtures, to extremely close tolerances.

Circle 48 on postcard for more data

Mechanical Presses

DOUBLE-CRANK, straight-side presses of welded steel construction from 100 to 300 tons capacity are built to JIC specifications. In addition they feature gears running in oil, mechanically interlocked pneumatic clutch and brake unit, barrel type motorized slide adjustment, automatic lubrication, pneumatic flywheel brake, die lights, die cushions, pneumatic counterbalances, and an interlocked electrical clutch control.

This line of machines can also be altered from these specifications to suit individual requirements. Electrical controls are also available to meet particular electrical standards. *Hamilton Press Div., Baldwin-Lima-Hamilton Corp.*

Circle 49 on postcard for more data

Tap Control

AUTOMATIC reversing control unit F268C, used as the control system for a standard model 24 Holomatic unit, affords operation either as a motor reversing type high-production tapping unit or as a production drilling unit. A three-position selector switch is on the cover.

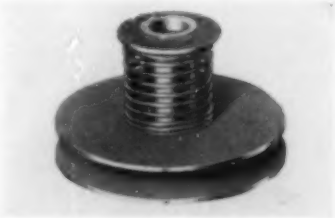
When tapping, the reversing of the motor is automatically coordinated with the retraction of the spindle through an air monitor line connected between the control panel and the Holomatic. This air monitor system of control greatly simplifies installation and allows standardization of the set-up procedures for both drilling and tapping. The tapping capacity of the units is ¾-16 in mild steel, and the drilling capacity is ⅝ in. Production rates of up to 30 tapped holes per minute can be obtained when special high reversal type motors are used for spindle drive. Standard open frame, low speed motors can be used for tapping up to five holes per minute.

The control provides complete overload protection for the drive motor. Holomatic units are designed for incorporation into special automation type drilling and tapping machines. *Hause Engineering.*

Circle 50 on postcard for more data

Pulley

A SO-CALLED low-cost ¾-hp variable speed pulley for new or old equipment has been developed. Oil impregnated bronze bearings are used. The new pulley delivers a speed ratio to 2¾ to 1, using an A section belt.



Lovejoy variable speed pulley

Maximum bore is ⅞ in. with keyway. The shaft bore runs through the entire length of the pulley, giving reverse mounting when necessary. The spring cover has been eliminated. The unit measures 4 13/16 in. overall length and six in. diam. Weight is 6½ lb. *Lovejoy Flexible Coupling Co.*

Circle 51 on postcard for more data

Resins

THREE premix Plaskon polyester resins are designed for rapid molding of intricate parts with varying wall thicknesses, difficult contours, and molded-in inserts. The resins are pre-mixed by the molder in large batches with filler pigment and reinforcing materials such as chopped glass or sisal compound. This mixture is then molded in matched metal dies using conventional compression molding presses.

PE-40 is a rigid resin containing diallyl phthalate. It permits fast curing cycles and produces molded parts with outstanding surface characteristics. It offers high flexural strength and modulus of elasticity, as well as excellent hot strength. PE-51, a resilient, high-viscosity resin containing diallyl phthalate, is designed specifically for those premix molding applications which require sufficient flexibility to minimize cracking around core pins and inserts. PE-55 is a resilient resin containing vinyltoluene. It is a medium viscosity resin available at a lower price than PE-40 and PE-51. *Barrett Div., Allied Chemical & Dye Corp.*

Circle 52 on postcard for more data

Rotary Table

A FLUID feed rotary table holds and delivers small parts to drill, tap, swage, stake, etc., 8, 12 or 24 stations

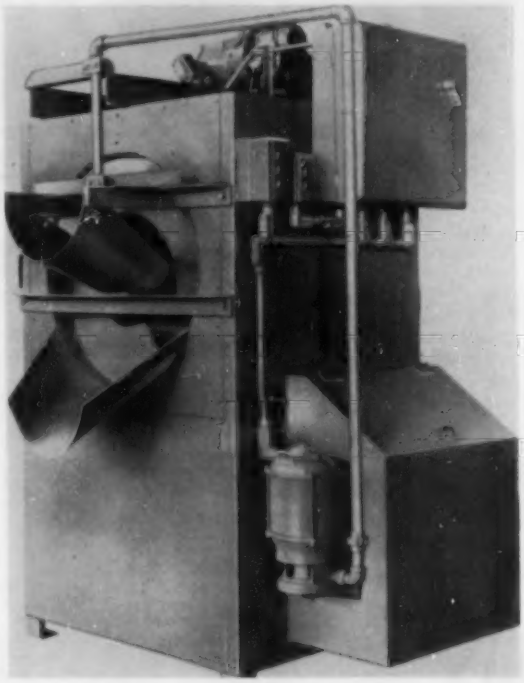
Various jobs can be tooled on separate dial plates used with the Mead index table

accurate to 0.003 in. The device provides positive, uniform air-hydraulic indexing. It will index slow or fast, up to 2800 per hour. The standard dial plate is 12 by ⅛ in., of ground steel, featuring a lever pawl release. Tables up to 20 in. can be handled. *Mead Specialties Co.*

Circle 53 on postcard for more data

Batch Washer for Small Parts

SMALL parts can be high-pressure spray-washed economically in bulk by means of a new small rotary-drum batch-type machine, reports the maker. Parts batches are introduced into the machine through the upper chute. The one-man-operated machine utilizes a drum with helical spiral to tumble parts gently and expose all surfaces to the high-pressure fan-shaped spray nozzles inside the drum. The drum, perforated to permit draining of the solution, oil, chips and impurities, retains only the washed parts. On completion of the cleaning cycle, the drum counter-revolves, automatically discharging the clean parts by means of the lower chute. Both chutes are located on the same side.



A-F rotary batch cleaning machine will handle up to 20 cu ft per hour

The washing, pumping, drum-reversing cycle can be either manual or automatic. If the installation is automatic, an adjustable timer is provided. Draining and quick flash-dry for all parts is accomplished through tumbling with pump off as parts are discharged. Drums can be made for any given batch capacity: a volume of two cu ft has been found ample for most operations. Cleaning solutions may be heated by steam, gas or electricity.

This development features heavy welded construction, easy accessibility to all parts, high-pressure cleaning with fan-shaped spray nozzles and high quality filter screens. *Alvey-Ferguson Co.*

Circle 54 on postcard for more data

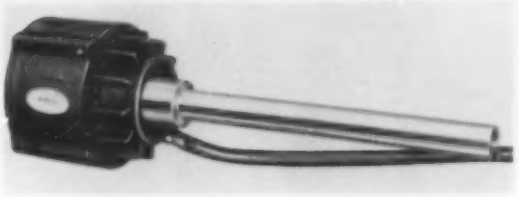
Magnesium Dolly

A LIGHT weight pallet dolly has been announced of all-magnesium construction. Weighing 31 to 42 lb, they are said to result in faster, more economical material flow in freight car loading or trucking operations. The dollies are fabricated of welded magnesium channels and are fully stress-relieved. Other features are: rounded corners, and 3½-in. diam rollers equipped with ball bearings and steel axles. Roller spacing may be even, or staggered, as required. The pallet dollies are available in six standard sizes and in capacities of 2000 or 4000 lb. Special sizes may be had on request. *Magline, Inc.*

Circle 55 on postcard for more data

Air Powered Collet Closer

AUTOMATIC collet closer model BCC-60 provides hollow spindle lathes and other rotating hollow spindle machines with automatic or semiautomatic stock holding. Collets may be opened and closed instantly without stopping the machine. Holding pressures do not vary from piece to piece. Variations in stock size do not affect the action, reports the manufacturer. The device consists of a hollow draw bar mounted through the center of an air cylinder. The machine collet, fastened to the end of the draw bar, is opened and closed by operating the air cylinder. The air cylinder is a nonrotating type and exerts a closing pressure equal to 25 times the air pressure applied. The draw bar permits through-feeding of stock up to a maximum of one in. in diameter. The BCC-60 mounts directly to the machine head stock. The draw bar is finished to accommodate the type of collet desired. This air collet closer may be pushbutton controlled by the operator or interlocked with the machine cycle for fully automatic operation. *Bellows Co.*



Bellows air collet closer, which can handle variations in stock size, may thus save grinding operation

Circle 56 on postcard for more data

Gear Checker

MODEL SIG-18-in. Red Ring gear checker for inspecting spur or helical internal gears up to 18-in. pitch diameter is now available. It checks internal helical and spur gear tooth-to-tooth spacing, pitch or root diameter eccentricity and size as well as parallelism of spur gears from 2 to 48 diametral pitch having pitch diameters from 2 to 18 in. A cast iron base supports a precision ball bearing vertical work spindle. The head that checks tooth spacing, size and eccentricity is mounted on an adjustable overarm that is supported by a vertical cast iron member which is slide-mounted on the base and raised up and down by a handwheel-controlled rack and pinion counter balanced drive.

The parallelism checking head for internal spur gears is mounted on vertical ball slides in a casting that slides in and out on a sub-plate bolted to the top of the base checker. An adjustable gear tooth locator mounted in a T-slot in the top face of the base is provided to approximately position the gear tooth space and prevent skipping teeth when indexing.

The tooth spacing and eccentricity checking head spindle has an adjustable spring load that advances the checking head to the tooth space to be checked. A small hand lever at the front of the checking head retracts the head during checking and also locks it back out of contact with the gear teeth during setup operations.

With an internal gear mounted in the work fixture, tooth index accuracy is checked by bringing the ball point on the overarm-supported checking head into contact in a tooth space and a pivot finger into contact with the side of a tooth in the adjacent tooth space. The opposite end of the pivot finger actuates a 0.0001-in. indicator. Indexing the work gear to the next space causes the indicator to read variations in tooth spacing.

Internal gear checker

The arm on the back of the checking spindle in this head actuates a 0.0005-in. indicator that registers the amount of advance of the ball point from space to space. This is a measure of eccentricity of the gear teeth. Size of the teeth can also be checked by setting the 0.0005-in. indicator to zero with a master gear and noting variations from this reading when other gears are checked.

Root diameter size and eccentricity can be checked independently with the overarm supported checking head by replacing the ball point with one that clears the sides of the teeth.

Parallelism of spur teeth is checked by bringing an indicator finger into contact with a tooth face and traversing up or down the face of the teeth by turning a small hand wheel. The indicator registers the amount and direction of taper or out-of-parallel condition. It will also check the amount and position of crown. Two indicators are provided to enable checking to be done on either side of the teeth. *National Broach & Machine Co.*

Circle 57 on postcard for more data

Grinding Fluid

CIMPLUS is a water-soluble, transparent concentrate that claims to give exceptional rust control at dilutions between 1:100 and 1:200. Though used primarily as a transparent grinding fluid, it can also be used to advantage when machining cast iron. And it can be used in Cimcool mixtures for the added rust control needed in hard water areas. *Cincinnati Milling Products Div.*

Circle 58 on postcard for more data

Checks Torque of Screwdrivers

THE Torque Analyzer is said to give a fast, accurate direct torque reading and indicate the area of trouble in defective power screwdrivers without disassembly. It utilizes the principle of driving a stud in a nut against a sensitive pressure gage. The stud and nut is of the ball-bearing type. The analyzer operates in a right hand direction only. Capacity is zero to 150 lb-in. to a ¼-in. male hexagon. Dead weight test wheel furnished. *Richmont, Inc.*

Circle 59 on postcard for more data

Wire-Wrap Tool

A NEW wire-wrap tool which makes solderless wrapped electrical connections with 14 and 16 gage wire has just been announced. Powered by an air motor, the tool makes connections in less than one second. Any solid 14 or 16 gage wire may be used with the tool. Terminals may be made from commonly used metals and may be square or rectangular. The maximum terminal dimensions are 0.132 by 0.132 in. with a minimum 0.375-in. spacing between terminals. Each connection is 11/32 in. long.

The tool weighs two lb and may be fitted with either a straight or offset pistol-grip handle. An automatic device stops the bit in the correct starting position. Construction features include alloy steel planetary gears, a positive engagement clutch, and ball bearings used on the motor spindle and idler gear plate. *Keller Tool Div., Gardner-Denver Co.*

Circle 60 on postcard for more data

Tool to make solderless connections

Air Control

EIGHT Governaire precision control devices for pneumatic loading and gaging are now in production. Types include pressure regulators, volume boosters and reversing relays. Specifications of a typical regulator, the Series 4000, include five ranges (10, 30, 60, 150 and 250 psi); high capacity ⅝ in. diam supply and exhaust seats; three sizes (⅜, ½ and ¾ in. NPT with two ¼ in. gage taps.) The Series is suited to such machine applications as welding head pressure control, punch press brake and clutch control, cable and sheet tensioning devices, etc. *Bellofram Corp.*

Circle 61 on postcard for more data

Air control devices by Bellofram

Piloted Valve

A GASKET-MOUNTED pilot-operated check valve for use with ⅜-in. piping in industrial oil-hydraulic systems is now available. It is suited for traverse and feed circuits, holding vertical loads and similar duty applications. Model 4CG-03 is of spring-closed poppet type construction, to provide uniformly consistent operation regardless of valve mounting position. These valves can be arranged in control systems to block flow in a given direction until opened by remotely applied pilot pressure and to allow free reverse flow. Rated capacity is eight gpm, for use in systems with operating pressures up to 2000 psi. Pilot pressure greater than 40 percent of system pressure is required to open. The units are available with either 30, 75 or 150 psi cracking pressure. Mounting subplates for the new valves are also available. *Vickers Inc.*

Circle 62 on postcard for more data

Speed Controls

COMPLETE one and 1½-hp Variac motor speed controls are available at a reduction in cost of about 25 per cent over earlier models. A drum controller is used in place of magnetic contactors as the switching unit for forward, reverse, and stop operations. The controller and the speed-adjusting portion are separate from the main chassis. A dynamic braking resistor is included for use where quick stopping is required. Overload protection of the Klixon type with appropriate time-delay characteristics is incorporated. *General Radio Co.*

Circle 63 on postcard for more data

Way Cover

AN extruded aluminum way cover provides positive protection against chips, grit or any foreign material from clogging or damaging machine ways or way mechanisms. The rigid construction permits the operator to walk on the covers while the machine is operating or idle.

The cover, built of interlocking, extruded aluminum panels 1⅛ in. wide, is custom-made to fit any width or length machine. *Futurmill, Inc.*

Circle 64 on postcard for more data

Air Motor

MODEL 6AM rotary air motor of two hp offers explosion-proof, variable-speed power with a simple valve control, over a range from 0 to 2000 rpm on air line pressures from 30 to 90 psi. Weight is 17 lb. Four light composition vanes slide in the rotor, maintaining a continuous seal and taking up for wear automatically. The motor is constructed to start and run with shaft in any position, and reportedly cannot burn out if stalled by overloads.

Gast rotary air motor

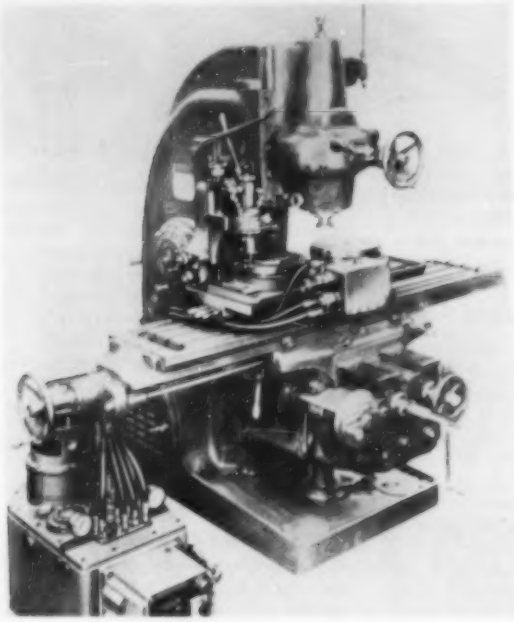
Muffler and mounting foot are standard equipment. Single shaft extension with counterclockwise rotation (shaft toward viewer) is standard; clockwise rotation is available. *Gast Manufacturing Corp.*

Circle 65 on postcard for more data

Cam Milling Fixture

An automatic self-contained fixture for 360-deg copy milling of cams, etc., can be used with any vertical milling machine of suitable capacity. The fixture consists of a base on which slides a table carrying two rotary tables. The table traverses on the base of a hydraulic cylinder. The rotary tables are mutually driven by a hydraulic motor through a worm and worm wheel and spur gear reduction drive. At the rear of the fixture on the base is mounted a vertical arm carrying combined slides which support the Hydrotracer attachment.

The unit is operated by a self-contained Vickers duplex pump. The tracer valve automatically controls the speed of rotation of the tables as well as the copying movement. The tables are rotated at varying speeds which give approximately a consistent rate of feed relative to the contour. The table also forms a coolant tray, making it possible to utilize the coolant unit of the machine. *Wickman Products Corp.*



Wickman-Hoyes Cammaster

Circle 66 on postcard for more data

Packings

New packing developments aimed at reducing maintenance costs and streamlining design procedure are being displayed. Special molded V packing adapters, made by combining shredded leather and synthetic rubber, offer resilient, long-lasting support. Known as Vix-Syn 10V55-D male and female adapters, this new concept in packing support provides better sealing, longer packing life and prevents cylinder damage. The adapters are designed to withstand constant flexing without fatigue cracking.

Other recent packing developments include a new fabricated V which offers stack height interchangeable with both leather and homogeneous V's. Square-shoulder, rubber-impregnated leather cup packings, Vim 1243-3, are completely impregnated with rubber. *E. F. Houghton & Co.*

Circle 67 on postcard for more data

Torque Measurer

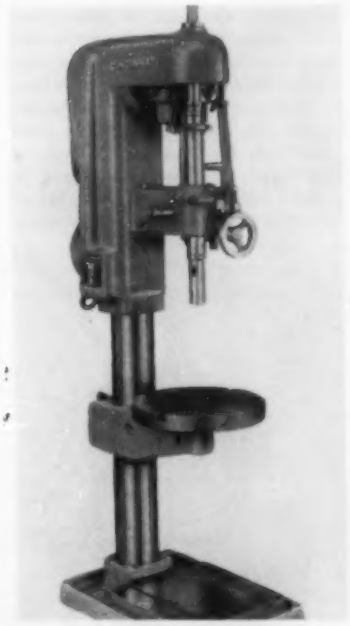
A new technique for measuring torque on ball bearings is used in a so-called mass accelerator. The new device is designed both for laboratory and factory use. A known inertia load is mounted on the outer race of the bearing. The inner race is rotated at a known speed. This is done in such a way that bearing friction torque is the only force which causes the outer race to move. Torque is determined, according to graph or empirical formula, by the number of inner race revolutions required to make the outer race carry out one-revolution. A synchronous instant-starting motor with the necessary circuitry to effect instant stops is used. The machine can handle all instrument bearings from 0.1875 to 1.500 in. outside diameter. *Control Instrument Co., subsidiary of Burroughs Co.*

Circle 68 on postcard for more data

Floor Drill

Details of 21-in. stationary head floor drills have been revealed. The drills are supplied with power feed as standard equipment, in addition to the sensitive hand lever and hand wheel feeds. A simple selector is used to obtain any of four rates of feed. A depth gage, incorporating a positive stop, is provided to disengage feed automatically. They are shipped with motor and controls.

The No. 4 Morse taper spindle is mounted in heavy duty ball bearings. Eight spindle speeds are provided, ranging from 23 to 400 rpm. No wrenches are required to change spindle speeds, and both hands are free to shift the V-belt to the proper position. A full belt guard is standard equipment. The drills are rated at 1½ in. in cast iron with one-hp, 1800 rpm motor. *Cincinnati Lathe and Tool Co.*



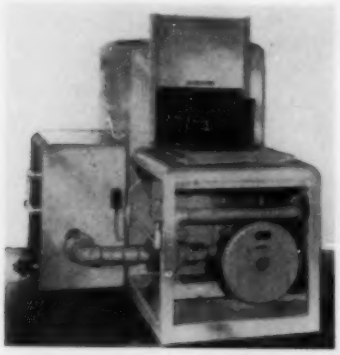
Cincinnati 21-in. drill

Circle 69 on postcard for more data

Washing Machine

DESIGNED especially for the heat treating department this packaged spray type washing machine is manufactured in standard sizes to fit 24 by 36 by 15 in. carbo-nitriding furnace trays. It is also available in 24 by 48 by 18 in. size, and all are available with optional door openings 20, 22 and 24 in. high. The gas-fired model G washer is heated by immersion tube with eductor. Spray nozzles above and below the work are supplied by a 240-gpm pump driven by a two-hp motor. The unit is supplied complete with magnetic starters, automatic temperature control, pilot safety device, and timer which automatically turns off the pump and lights a signal light at the completion of the cycle. The Waukee washer can be supplied either electrically or steam heated as well as gas-fired.

Maximum gas consumption is 300 cfh of 1020-BTU gas. Storage capacity of the washer is 500 gallons. Other features include automatic liquid level control, rugged construction for long



Waukee parts washer

life, and complete control grouping under front deck for ease of maintenance and accessibility. Straight-through designs are available, as well as multi-stage units requiring rinse and dry sections. *Waukee Engineering Co.*

Circle 70 on postcard for more data

Rerated Motors

IMPROVED motors conforming to the dimensional standards recently adopted by NEMA have been placed in production. Designed more compactly than previous types, the same horsepower is provided in less space with reduced weight.

The new design is designated as type H and is said to be engineered with many improved features and performance. An air opening placed low in the end-bell protects the winding from liquids and abrasive dust. Currently standard ratings are available in frame sizes 182, 184, 213, 215, 254U, and 256U. *Electro Dynamic Div., General Dynamics Corp.*

Circle 71 on postcard for more data

Coolant Chiller

THE Lundholm liquid chiller line includes both horizontal and vertical cabinet units in sizes ranging upward from five gpm. The model X horizontal unit is made in sizes ranging from two through 7½ hp. These units, 46 by 26 by 30 in., are designed for stacked multiple installations to save floor space. The model H-T chiller vertical unit with a 7½-hp semi-hermetic unit is only 26 in. square, 50 in. high and will handle 30 gpm with a six-degree temperature difference.

All chillers are made of welded steel frames and heavy sheet metal cabinets. Flexible vibration eliminators are installed on the refrigeration lines. High and low pressure controls are wired in series with the thermostat control. The units are furnished with drier, expansion valve, combination pressure control, temperature control and water valve on water cooled models. *Industrial Filtration Co.*

Circle 72 on postcard for more data

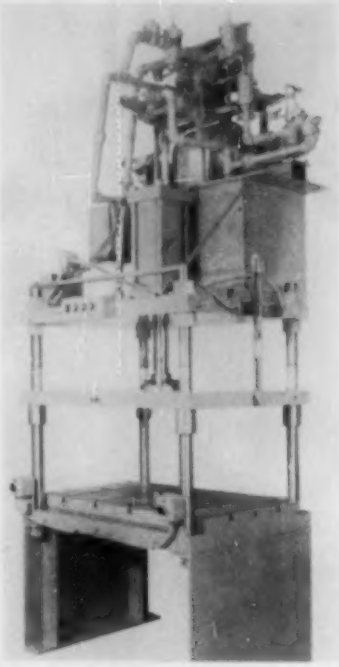
Silicones

SIX new organo-silicone compounds with reportedly unusual lubricating and solubility properties have been developed. Designated X-520, X-521, X-522, X-525, X-526, and X-527 these chemicals are offered for development purposes and are also available in commercial quantities. It is expected that they will find uses as special lubricants, as release agents for rubber and plastics; and as emulsifying agents or emulsion breakers. The new compounds are said to have excellent release properties, special thermal and viscosity stability and water repellency. In addition, they have lubrication and anti-wear properties that rival those of petroleum oils; they can be used as emulsion breakers for oil products, or as emulsifying agents under other conditions. Four are water soluble and two are easily soluble in both high and low aromatic solvents. *Linde Air Products Co.*

Circle 73 on postcard for more data

Hydraulic Press

SELF-CONTAINED presses for trimming, molding, forming and similar operations are being built in sizes from 25 to 100 tons. The four-column presses feature steel construction and



This press has a 14-in. stroke, pressurized to eliminate any lag of power.

provide adjustable shut height, and adjustable daylight with an inching control in the top platen. The ground columns fit line bored holes in the platens. A T-slotted precision ground bolster plate is standard.

Power is supplied from a differential circuit type hydraulic unit with high and low pressure pumps driven by a double shaft motor. Electrical controls are well interlocked for safety. Any part of the cylinder stroke may be used. *Paul Machine Tool & Die Works.*

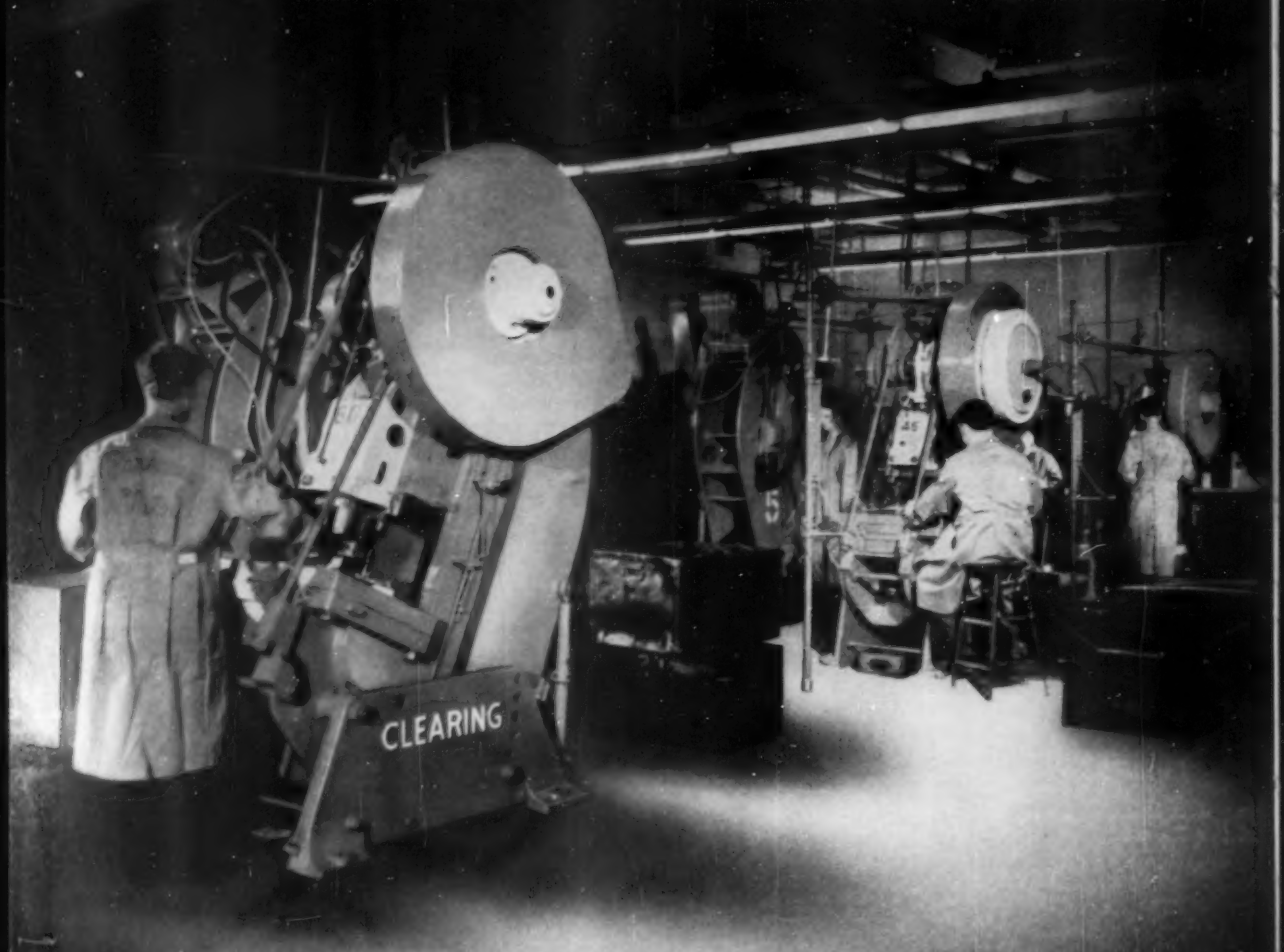
Circle 74 on postcard for more data

LPG Lift Truck

THE gas-electric Dynamotive fork lift truck now features a new LP gas engine, allowing it to operate on either propane or butane gas, available in capacities of 4000 to 10,000 lb. Engine life in many instances has been doubled, the company states. *Automatic Transportation Co.*

Circle 75 on postcard for more data

INDUSTRY GEARS FOR HIGHER PRODUCTIVE STANDARDS



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ask C.P.C.*

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Free INFORMATION SERVICE

Use either of these postcards for Free Literature listed below, or for more information on New Production Equipment and New Products described in this issue.

USE THIS POSTCARD

FREE LITERATURE

A-C System 1

Alternators designed for fleets of small trucks and over-the-road trucks include a light-duty unit and a heavy-duty unit, both with capacities of 12 v, 50 amp; also a light-duty model and a heavy-duty model with capacities of 6 v, 60 amperes. Brochure. *Leece-Neville Co.*

Precision Making 2

Current technology of precision mechanism manufacture is pictorially reviewed in a 32-page publication, including plate processing, mass production of small precision parts, tool and die production, metals processing, assembly and development. *Allied Products Div., Hamilton Watch Co.*

Mountings 3

Vibration mountings of rubber in shear, for medium and heavy weight machinery, are described in a catalog just issued. No. FP-55. *T. R. Finn Co.*

3000-psi Valve 4

Series 4000 slide-type sequence valves for 3000 psi hydraulic service feature extremely low leakage and low pressure drop. A four-page data sheet describes and illustrates these valves, which offer in stock models a standard maximum internal leakage of 15 drops per minute. Special models are available with maximum leakage values as low as five drops per minute. *Aircraft Products Co.*

Gages 5

A broad variety of standard and special gages and measurement control methods, including built-up gages, air gage fixtures and unusual air gage applications, are illustrated in a pictorial brochure issued by *Freeland Gauge Co.*

Chromizing 6

Nineteen applications of a surface alloying technique for increasing the heat, wear and corrosion resistance of ferrous metals by diffusing chromium into the surface at high temperatures are described in a four-page bulletin. *Chromalloy Corp.*

Null Indicator 7

The Magnetik Null Indicator, a portable temperature measuring instrument, is described in a new bulletin. It provides complete engineering data on the low-level, linear-deflection d-c null indicator. Included is a technical description of the engineering concept of the division's second harmonic magnetic converter. *Doelcam, a division of Minneapolis-Honeywell Regulator Co.*

Pattern Wood 8

Dimensionally stable, treated and laminated Honduras mahogany that is being successfully used for original die models and patterns is fully illustrated with comparative photographs, graphs and tables in a folder. *Aetna Plywood & Veneer Co.*

(Please turn page)

VOID After Feb. 15, 1956 12/15/55

Circle code numbers below for Free Literature, New Plant Equipment, or New Product Information

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Readers Service Dept.

Belts 9

Featured in a conveyor belt data sheet is the new tan Koroseal belt which resists chemicals and oils which break down rubber compounds. Also included are Caripack, a black, all-purpose oilproof belt; Highseal, a green belt recommended for use on inspection lines because of its color. Highseal also resists moisture, acids, most greases, fats and alkalies. An Economy belt is recommended where oil resistance is not required. The data sheet also introduces a new fabric, known as CP. *B. F. Goodrich Co.*

Valves 10

Shear-Seal valves are cataloged by major service condition air, oil, water. Three bulletins; 'A-5,' covering manually and foot operated air valves up to 4000 psi; 'W-5,' manual water valves up to 6000 psi; and '0-5,' manual oil valves up 0 to 6000 psi include valve characteristics, flow patterns, overall dimensions, photographs. *Barksdale Valves.*

Silver Brazing 11

Using preformed alloy coils, rings and flat washers in production silver brazing is illustrated in a technical booklet, which includes recommendations on types of joints and flux. *Lucas-Milhaupt Engineering Co.*

Jig Borers 12

Details of Electrolimit jig borers in a number of sizes are outlined, together with optional equipment, in 28-page circular No. 587. *Pratt & Whitney Co.*

USE THIS POSTCARD

Upholstering 13

Production of automobile upholstery and interiors is shown in bulletin No. 270. It pictures types of seaming used in automotive upholstery work and machines designed to perform particular operations. A simple chart is also included which lists typical operations and recommended equipment for each. *Union Special Machine Co.*

Magnetic Tape 14

A new magnetic tape recording and playback system for recording stress, pressure, temperature and vibration is outlined in bulletin 1561 A. The multichannel system is portable and of sectionalized design for air or ground setups. *Consolidated Engineering Corp.*

Marking Tools 15

No. 11 brochure, "Marking Tools and Marking Equipment," 15 pages, illustrates and explains marking tools from hand stamps to automatic marking machines, the products on which they are used and various Fixture Setups for marking operations. *Geo T. Schmidt, Inc.*

Teflon 16

Nine applications of Teflon tetrafluoroethylene resin are pictured and described in Product Engineering Bulletin No. 3. *Du Pont.*

Centerless Grinder 17

Two sizes of centerless grinders are shown in a 26-page catalog with specifications and extra equipment and automation ideas. *Landis Tool Co.*

Flexible Couplings 18

A reference catalog on flexible, gear-type mechanical couplings describes the new Sphereflex line of curved root, spherical tooth couplings. *Philadelphia Gear Works.*

Forming Plastics

"Extruderitems" is a new periodical issued to give information on contour extrusion and vacuum forming vinyl, polyethylene and styrene plastics. Write to *Bakelite Co., Dept.* 46, 300 *Madison Ave., New York* 17, *N. Y.*

Facilities Brochure

Engineering services and products of turbo-machinery and propulsion devices, for general or special projects in naval and aircraft propulsion, auxiliary power units and accessory equipment for aircraft and naval vessels, and wind-tunnel machinery, are described in a brochure. Write on letterhead to *Propulsion Research Corp., 1860 Franklin, Santa Monica, Calif.*

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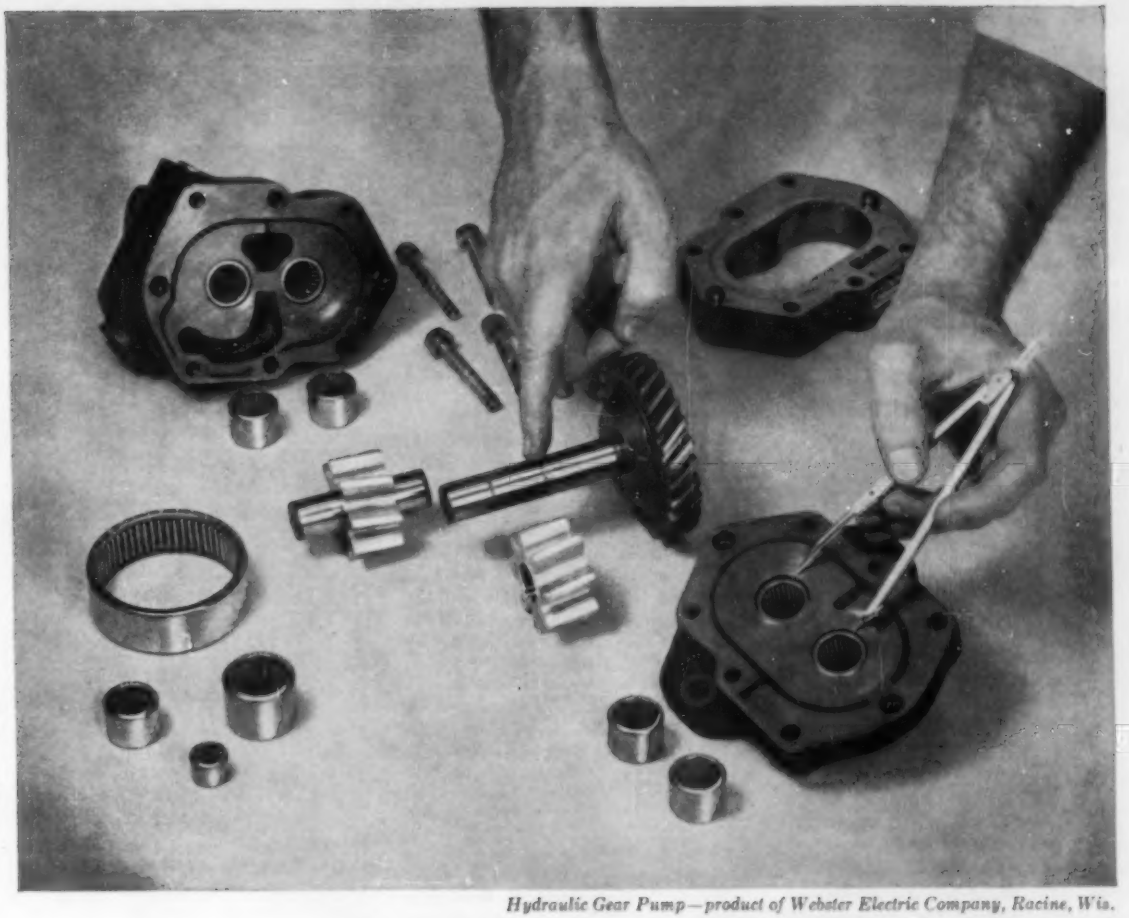

Hydraulic Gear Pump—product of Webster Electric Company, Racine, Wis.

"You can use bigger shafts with
TORRINGTON NEEDLE BEARINGS"

How to achieve a bearing assembly of minimum size while maintaining maximum shaft rigidity—that's a puzzler that many a design engineer has had to sweat out.

The Torrington Needle Bearing—because of its unique unit construction—has helped solve that problem in literally thousands of products throughout industry where it has become "standard equipment."

With its full complement of small diameter rollers, the Needle Bearing offers greater radial load capacity than any other anti-friction bearing of the same size. And because of its thin section, it permits the use of larger shafts to minimize deflection.

In addition, a Needle Bearing needs no inner race when running on a properly hardened shaft.

For twenty years our Engineering Department has helped designers and manufacturers to adapt the unique advantages of the Needle Bearing to their products. Let us help you with your anti-friction problems.

See our new Needle Bearing Catalog in the 1955 Sweet's Product Design File —or write direct for a catalog.

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- low unit cost
- long service life
- compactness and light weight
- runs directly on hardened shafts
- permits larger and stiffer shafts

NEW PRODUCTS AUTOMOTIVE-AVIATION

FOR ADDITIONAL INFORMATION, please use reply card on PAGE 89

Windshield Washer

The CO coordinated washer with self starting wipers automatically sprays solvent, starts blades, stops spray and parks blades. The sequence

starts with the driver's triggering of the control button. The water-solvent mixture is jetted on the windshield and the wipers are activated. After the surface is cleaned, the fluid stops but the blades keep going to remove the surplus liquid, then stop. *Trico Products Corp.*

Circle 25 on postcard for more data

Gear Pump

A positive displacement aircraft pump for MIL-O-5606 fluid is rated at two hp input, two gpm at 3750 rpm and 1500 psi. The 2.6-lb unit has heavy bronze bearings, special seal, and features design which prevents cavitation and turbulence to the pumping area. *Lear-Romec Div., Lear, Inc.*

Circle 26 on postcard for more data

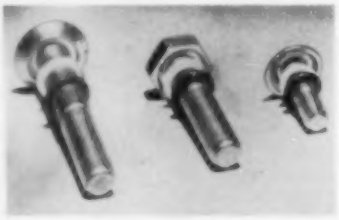
Locknuts

Lightweight stainless steel anchor and gang channel locknuts for use to 800 F, and for applications where nonmagnetic requirements exist, has been designed. The 70LHA401 and 70LHG-41 series are said to be the lightest available nuts qualified to these conditions. Configurations in the 70LHA line include one and two lug anchor or plate nut shapes. One type 321 stainless steel floating nut body in the series has a 0.030 in. minimum radial float and another design offers multiple floating nuts installed in a strip of stainless steel channel. Thread sizes available in the anchor line for each configuration are 6-32, 8-32, 10-32 and ¼-28. These sizes with the exception of 6-32 also are available in the gang channel nuts. *Elastic Stop Nut Corp. of America.*

Circle 27 on postcard for more data

Sealing Fasteners

Fasteners of a new design seal the mating surface to the head of the threaded portion. They reportedly provide maximum shear and tensile strength qualities as found in their AN and NAS counterparts. Sealing is accomplished by the use of a standard AN or MS O ring nestled in the



groove cold-headed into the fasteners.

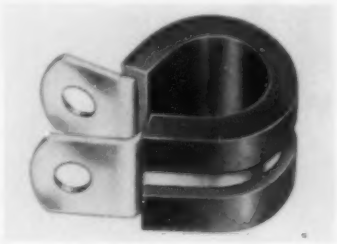
These fasteners are reusable many times without galling or the need for lubricating or "gooping" the seal ring. A thin Teflon washer placed between the O ring and the head of the fastener eliminates friction and allows the rubber to flow evenly in all directions. Heads are slightly oversize to incorporate the groove.

Available in all popular head styles, including the 100 deg countersunk type, the fasteners come completely assembled ready for use. *Aero Bolt & Screw Co.*

Circle 28 on postcard for more data

Cushioned Clamp

Silicone impregnated fiber glass clamps reportedly are heat and abrasion resistant from below —90 F to above 550 F. Made in a range of



sizes, No. 82626 clamps are said to be easily installed on "bundle" or removed. The maker states the clamps retain a firm, cushioned grip through severe vibration. If the material chars, there still remains a safe, nonconducting layer. *Adel Precision Product, Div. of General Metals Corp.*

Circle 29 on postcard for more data

Actuator

The R-580 a-c or d-c linear actuator is rated at 650 lb maximum operating load, 2000 lb ultimate static load yet weighs only two lb and conforms to specification MIL-A-8064. *Airborne Accessories Corp.*

Circle 30 on postcard for more data

Mylar Dye

A continuous method of dyeing all gages of Mylar polyester film with colors that penetrate and become part of the film itself has been developed by Martin Processing Co. This method dyes in colors and shades ranging from delicate pastels to jet black. The plastic can be used in the manufacture of vacuum metalized, decorative surfacing materials, metallic and plain decorative yarns for textiles, wire serving, and other applications. Dyed film also can be given a matte finish. *Du Pont Co.*

Circle 31 on postcard for more data

Hour Meter

A new direct-reading engine hour meter has just been added. Black figures show at a glance the total number of hours an engine has been operating; the red figure at the right indicates tenths of hours. A rotating disk in the upper left segment of the

face of the meter acts as an operating indicator, making one revolution a minute. It is a true timing instrument (not a revolution counter); the timing mechanism is an electrically wound clock. The meter is available in 6, 12, 24, 32, 64 and 110-volt models in three basic types: standard (mounted with three screws); flush-mounting (held in place by a stirrup, no screws required; and aircraft (standard aircraft installation). *John W. Hobbs Corp., Div. of Stewart-Warner Corp.*

Circle 32 on postcard for more data

Bulk Filter

Three separator-filters for handling both avgas and jet fuel at a rate of 225 gpm are said to remove better than 99 per cent solids and 100 per cent of the water from the fuel. Two of the models have received Naval Engineering approval, while the third model is a commercial adaptation of the Navy approved separator-filters. Performance figures on the three models are identical. The two Navy approved separator-filters PASF-225J and PASF-225H, are constructed of aluminum bronze, meet MIL-F-8508 specifications. The PASF-225J model contains 14 coalescer elements placed horizontally, and eleven of each of two types of final stage elements placed vertically.

The commercial adaptation of the military separator-filters is a horizontal two-stage separator identical to PASF-225J but has a steel body and aluminum division plates and element parts. The commercial application can be mounted horizontally in the rear bucket box compartment of refuelers or on carts. Stands are available for stationary installations. The PASF-225K for commercial use, has a rating of 300 gpm for avgas; 225 gpm for JP-4, JP-5, kerosene, and 180 gpm for Diesel fuel. *Purolator Products, Inc.*

Circle 33 on postcard for more data

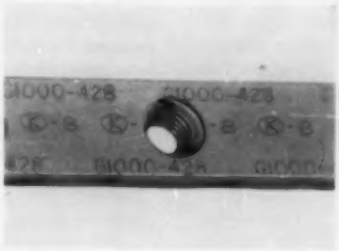
Battery Separator

So-called low cost battery separators are now in production, by a special process using Douglas fir wood fiber and phenolic resin. The new process is reported to permit uniform acid diffusion, and impart greater strength and resistance to brittleness. *Evans Products Co.*

Circle 34 on postcard for more data

Channel Named

Impression-stamped part number identification has been announced as a new feature of all standard Kaylock self-locking, lightweight gang channel. This permanent marking is applied repetitively to the back of the channel throughout its length and shows the nut spacing in ⅛-in. increments in addition to the basic part



number. The gang channel is currently made in thread sizes 6-32, 8-32, 10-32, ¼-28, and 5/16-24, in six-ft lengths. *Kaynar Co.*

Circle 35 on postcard for more data

Recorder

A recorder for making voice recordings in aircraft from microphones, radio sets and intercommunication systems has been developed. Both remote-controlled and local-controlled equipment for recording complete and detailed pilot observations on all flight operations is available. The recording is made on a 60-minute magazine. *Peirce Wire Recorder Corp.*

Circle 36 on postcard for more data

Heavy Duty Clutch

New type clutches recently developed and field tested are offered under the trade-mark name of "Morlife." The clutch plates used in these new clutches are best adapted for heavy duty machines such as tractors, trucks, cranes, shovels, bulldozers, tanks, earth movers, graders, and other heavy machines. Field tests reported by the company to show that the clutches provide up to 100 per cent more torque capacity and permit

the use of smaller diameter, less expensive clutches, and require less lever or pedal pressure for engaging and disengaging. Work life is said to have been increased as much as 400 per cent. Heat dissipation has been improved to the extent that excessively burned or warped clutch plates have been eliminated, and torque reportedly does not fade as heat increases. The new clutches are recommended for use only when specifically engineered into the machine. *Rockford Clutch Div., Borg-Warner Corp.*

Circle 37 on postcard for more data

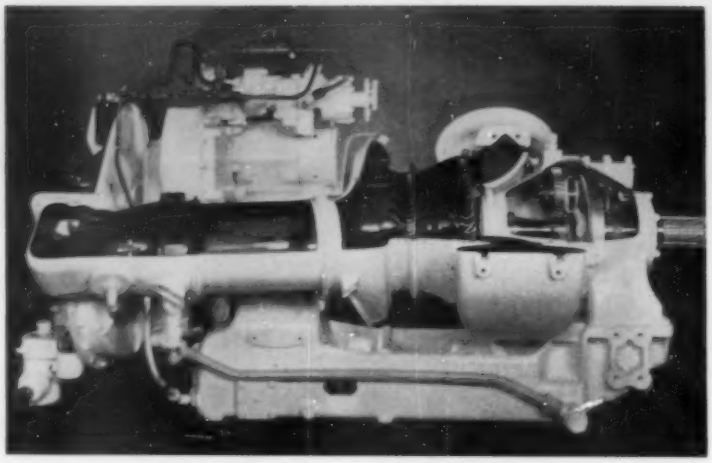
Small Gas Generator

A gas generator hardly bigger than four in. long and three in. in diameter, yet capable of producing about 850 jet horsepower, was developed for application to guided missile propulsion systems.

Using no moving parts, the gas generator is designed to convert liquid hydrogen peroxide into a high pressure, high temperature gas stream of free oxygen and steam. This jet may then be directed against a turbine wheel and the rotative power thus generated may be used in the same manner as any turbine-generated power. *Aircraft Gas Turbine Div., General Electric Co.*

Circle 38 on postcard for more data

Vibration Problems in GAS TURBINE ENGINES



Part-cutaway view of Boeing Model 502 gas turbine

By Henry C. Hill
Gas Turbine Project, Boeing Airplane Co.

We are finding that the gas turbine enters several brand-new fields of mechanical engineering not touched in reciprocating engine practice. One of these is high-frequency vibration, together with the associated problems of rotor balance and rotor bearing design. Another is burner design with particular reference to elimination of carbon formation with Diesel-type fuels. The need for both of these investigations arose from service problems in the field affecting reliability and engine life. We have also found in the course of corrective studies that both problems have significance in connection with manufacturing cost and engine-fuel consumption. Thus, in describing this engineering progress, we are touching on the three biggest questions affecting the future role of the small gas turbine, namely, service life, manufacturing cost, and fuel economy.

The small gas turbine is of necessity a high-speed machine. The smaller the physical size of the engine, the higher will be the rotor speed, in a fairly well-fixed mathematical relation. Rotor speeds for the output range of 100 to 400 hp are in the 30,000 to 50,000 rpm range—a very marked change from piston engine shaft speeds. Even though some of the small piston engines in the less-than-50-hp class, such as outboard engines, have achieved the remarkable rated speed of 10,000 rpm, it is interesting to note that this is less than the idle speed of he 175-hp Boeing turbine, which is 15,000 rpm.

The gas producer rotor used in these turbines runs at 36,000 rpm rated speed and is mounted on three bearings, a ball bearing at the compressor end, which takes the thrust, and two floating sleeve bearings, one near the center of the shaft and one at the turbine end. While quite simple in design and of relatively low manufacturing cost, this sleeve bearing has proved to have remarkable reliability and endurance characteristics. The reasons for this were not fully apparent until recent rotor-balancing studies disclosed that the double clearance in the floating sleeve is sufficient to accommodate a relatively large unbalance without excessive loading on the bearing. In other words, the bearing clearance is large enough to allow the rotor to shift its rotational axis away from the shaft center to the true balance center. It has been found, for instance, that the turbine bearing suffers no distress with a turbine blade missing, a condition which results in a bad out-of-balance of the turbine wheel. The relatively close clearances of antifriction bearings promote very high loads from relatively small amounts of unbalance, at the high speeds required in small turbines. One in.-oz of unbalance, for example, will cause a bearing load of 2200 lb at 36,000 rpm, if there is no clearance in the bearing. But if the bearing clearance will permit a shift of 0.005 in. in the rotational axis of the journal, then the rotor can remain in running balance with no loading on the bearing in spite of the one-in.-oz balance error.

The rotor of a later engine model, the 502-10, runs at the same speed of 36,000 rpm but the impeller and turbine wheels are somewhat larger and heavier to provide the higher pressure ratio and improved efficiency of this engine. Fuel consumption has been reduced 25 per cent and power increased a corresponding amount. The center and turbine bearings on this rotor are the same as on the one previously described. The ball thrust bearing adjacent to the compressor, however, becomes a more difficult problem here because of the higher thrust loads. So also is the rotor balancing more critical to avoid radial overloads in the ball bearing and corresponding high frequency vibration of the engine. Even with precision-type ball bearings, practical manufacturing tolerances give up to 0.0002-in. runout of he inner ball race and another 0.0002-in. in the outer race. At 36,000 rpm this runout tolerance can cause a 600-c vibration of the engine

(*Turn to page* 122, *please*)

A Mechanical Eye...

Ford Cuts Tool Costs with Cross Machine Control Units

One of the Cross Machine Control Units at Ford Motor Company's Cleveland Engine Plant

(U. S. Patent Nos. 2679038 and D-163935. Others pending).

According to records, 221 Cross Machine Control Units in operation at Ford Motor Company Plants are assisting them greatly in improving tool trouble conditions.

One reason for this is that the Machine Control Unit provides a definite and convenient place for storing tools . . . tools which are pre-set so they can be placed in operation immediately without making machine adjustments.

Another reason is that the Cross Toolometer, an integral part of the Machine Control Unit, provides a standard for the performance of the tools, thereby enabling corrective action to be taken when necessary. The Toolometer dial is set to indicate the number of pieces which a given tool should produce. When the dial has reached that pre-determined figure, the machine automatically shuts down and the tools are changed. At the same time, other tools indicated by the Toolometer as approaching the end of their usefulness are also changed to take full advantage of the machine shut down.

The Cross Machine Control Unit is helping to keep Ford production going and is also assisting greatly in controlling tool life.

Established 1898

THE CROSS CO.

DETROIT 7, MICHIGAN

Special MACHINE TOOLS

Super-Size Universal Joint Used in Aircraft Engine Testing Unit

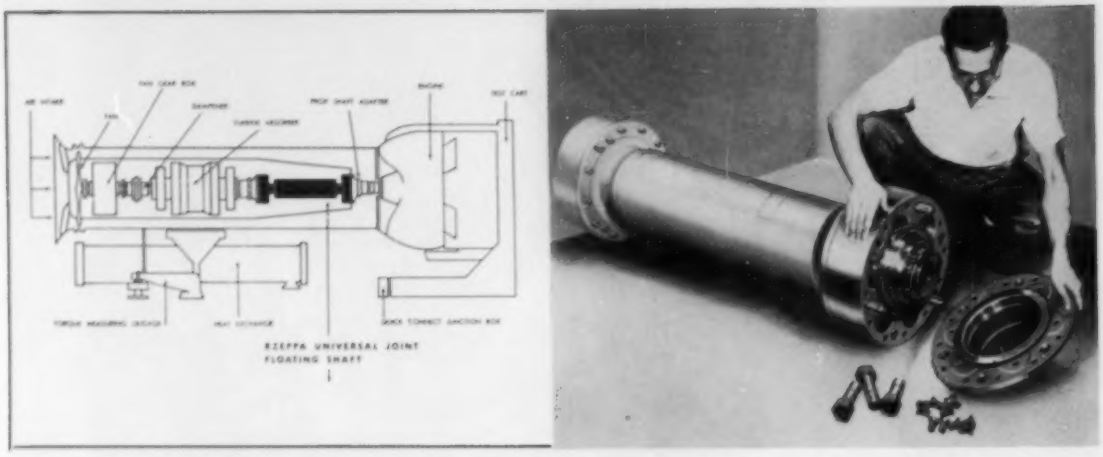


Diagram of packaged aircraft engine testing facility shows turbine power absorber, engine cooling fan assembly, and floating shaft assembly connecting two Rzeppa constant velocity universal joints. At right is a close-up view of the large universal joint assembly of 16¼ in. OD. Rotary motion is transmitted through the floating shaft at a true constant velocity from engine to dynamometer.

A COMPLETELY packaged, propellerless aircraft engine testing facility was recently installed at Trans-World Airlines Overhaul Base, Kansas City, Kans. The test facility was manufactured by Clayton Mfg. Co., El Monte, Calif.

One of the major problems faced in developing the test facility was obtaining an extra large universal joint which would transmit motion uniformly from the aircraft engine to the dynamometer. Believed to be the largest ever manufactured, the joint was designed and engineered by the Rzeppa Joint Division of Gar Grinding Machine Co.

The engine may be secured to the test unit with comparative ease in the packaged facility. Bare engines, or engines in the flight "pod," may be mounted on a test stand or cart, with all necessary preparations having been made previously in the engine preparation area.

The complete unit is then taken to the test cell where the stand, or cart, is automatically guided into position. Controls and accessory connections are made by a quick-coupler box located in the control room.

Space required for the testing operation is greatly reduced also. The several propellers required by a variety of engines, engine barrel, supplemental cooling system ducts, blower, controls, and the work scaffold are no longer necessary. The new package unit also replaces the dynamometer, dynamometer controls, and instruments, engine to dynamometer coupling, engine stand, and engine cooling system.

Each component was to complement specifically the unit for the job. They conceived of each facility as a unit-built machine which would include a turbine power absorber, engine-cooling fan assembly, and floating shaft coupling to link the turbine to the engine undergoing the test.

At each end of the shaft a universal joint was needed to transmit the velocity from engine to turbine.

Due to the strict requirements made by the manufacturer, none of the existing joints could be used. A larger, more durable assembly was sought which would transmit the rotating motion at a constant velocity from aircraft engine to turbine.

With the constant velocity joint assembly as an integral part of the unit, the manufacturer was able to put the aircraft testing facility into production. The finished machine, through elimination of frictional members, and overall simplicity of design, measures torque of the engine to within 0.5 per cent of the observed reading. Furthermore, speed is counted and indicated directly within one rpm.

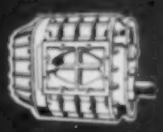
The constant velocity universal joint assembly eliminates radial forces making it possible to test engines on their flight mounts and without critical alignment of engine and dynamometer shafts. The low rotative inertia of the combined rotating parts permits simple coupling design and maintenance.

Low operational cost is said to be assured, since the engine cooling fan requires no external source of power; hence, total electrical consumption is the equivalent of 3.5 hp (although some installations require seven hp).

Specialists for over 37 Years in

FLUID FLOW and VIBRATION DAMPING PRODUCTS

Schwitzer has extensive Research and Engineering facilities and experienced technicians to develop an economical product—for the Flow of Air, Oil, Water and other Fluids—or the Isolation or Elimination of Vibration in your equipment, whether it is in the Automotive, Atomic, Aircraft, Agricultural, Earth Moving, or other fields.



Schwitzer utilizes the most modern production facilities for the Fabrication, Assembly and Testing of these Precision Products—for high or low volume production.

These services are available to you for product development applications in many diversified fields.

SCHWITZER

CORPORATION

INDIANAPOLIS, INDIANA

AIR BRIEFS

By RALPH H. McCLARREN

Collier Trophy Award

"For the greatest achievement in aviation in 1954," Richard Travis Whitcomb, a research scientist for the National Advisory Committee for Aeronautics, has been unanimously selected to receive the Collier Trophy.

Mr. Whitcomb was chosen for the high award for his discovery and experimental verification of the "Area Rule," which has led to the development of the pinched waist design for increasing the performance of supersonic aircraft. Applied to the Grumman F9F-9 Navy Shipboard Fighter this discovery enabled that plane to exceed the speed of sound in level flight.

Whitcomb's Area Rule was also used in modifying the Convair F-102, an Air Force Delta Wing Interceptor. It added more than 100 mph to the top speed of the plane without increasing the horsepower of the engine.

The Collier Trophy was founded in 1911 by the late Robert J. Collier. It will be presented to Whitcomb at the annual Wright Memorial Dinner in Washington, D. C., on December 17th. Anniversary date of the Wrights' first flight at Kitty Hawk, North Carolina on December 17, 1903.

Convertible Aircraft Congress

Sponsored by a group of enthusiastic designers, inventors and pilots banded together as the Convertible Aircraft Pioneers, the Third National Convertible Aircraft Congress was held in Philadelphia on November 25 at The Franklin Institute. Some 150 representatives of the Air Force, Navy's Bureau of Aeronautics, Army Transportation Corps and the Aircraft Industry met in the Institutes' Lecture Hall to hear about the latest developments in this newest of aircraft. The Convertiplane combines in one machine the vertical flight of the helicopter with the fast forward flight characteristic of the airplane.

Captain Ralph S. Barnaby, U.S.N. Retired, chairman of the program committee, opened the meeting. Before introducing the first of the speakers he called attention to the new emblem of the Convertible Aircraft Pioneers, a Dragon Fly. He explained that the Dragon Fly best represented a convertiplane because of its easy and rapid transition from hovering or stationary flight to full speed ahead or forward flight.

Report from the Air Force

Colonel Wm. Zinns, Chief, Rotary Wing Section, Air Research and Development Command, USAF, Wright-Patterson Air Force Base, Dayton, Ohio, reviewed the co-sponsored Army-Air Force activity in convertiplanes. Starting with a design competition in 1950, three types were selected for design and development. The idling rotor type as now represented by the McDonnell XV-1, the tilting rotor type as represented by Bell Aircraft's XV-3 and the Transcendental's Model 1G and the retractable rotor type as designed by Sikorsky Aircraft Co. and Hiller Helicopters, Inc.

To date the XV-1 has flown 20 hours and tested on the ground 220 hours. For vertical flight its Continental 330 hp engine drives an air compressor. This air is piped out through the three rotor blades to tip-located compressor jets, each developing 175 lb of thrust by burning fuel with compressed air. During transition from vertical to forward flight the compressor is automatically de-clutched and a pusher propeller actuated to provide thrust. The rotor speed slows down from 410 rpm to 180 rpm. Lift is transferred from the rotor to a small fixed wing to efficiently sustain the aircraft in forward flight.

Prior to flight testing the XV-1, many scale model and full-scale wind tunnel tests were made to determine its flight performance. Results of these tests proved to be very close to the actual flight performance. Although no attempt was made to break any flight records, the XV-1 in forward flight with rotor idling (180 rpm) attained a speed of 180 mph, about 21 mph faster than the present helicopter speed record. An Air Force flight test program is expected to start about January 1, 1956, at the completion of the Contractor's test program.

Tilting Rotor Convertiplane, the XV-3 developed by Bell Aircraft Corp., has recently made its first vertical flight and flown as a helicopter in forward, backward and sideward flight. It has two 25-ft diameter, three-bladed rotors located at the wing tips of a 31-ft-span fixed wing. For vertical flight the rotor shafts are upright and driven by gears and shafting from a Pratt and Whitney 450 hp engine located in the fuselage.

(*Turn to page* 134, *please*)

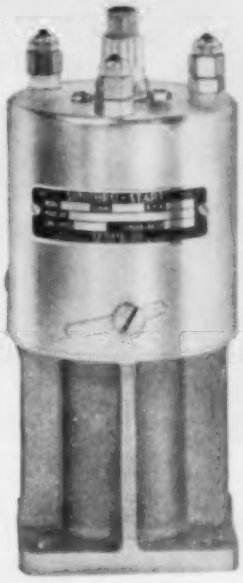
3 ELEMENT
SPEED SENSITIVE SWITCHES

STANDARD GOVERNOR FLY-WEIGHT PRINCIPLE

SNAP-ACTION SWITCHES

SPLASH PROOF

FLEXIBLE DRIVE SHAFT TO COMPENSATE FOR MISALIGNMENT



MODEL GA-3

NO BRUSHES OR COLLECTOR RINGS

SEALED BALL BEARINGS

ADJUSTABLE WHILE RUNNING

HIGH REPEATABLE ACCURACY

Synchro-Start Model GA-3 is a three element governor having a housing suitable for direct mounting on an AND 20005 engine tachometer pad. It contains three snap-action switches that may be independently adjusted to open and close circuits at any speed between 1,200 to 10,000 RPM. Particularly adaptable to the more elaborate engine and turbine control systems.

DIMENSIONS—Diameter 2⅝"—Length 6"—Weight 1¾ lbs.

Other models of Synchro-Start governors are available with 1, 2, and 3 switches together with a variation of mountings.

Further information upon request.

Synchro-Start Products Inc.

8151 N. RIDGEWAY AVE.
SKOKIE, ILLINOIS

News of the AUTOMOTIVE AND AVIATION INDUSTRIES

Continued from Page 39

Three More Companies Sign Pacts With Union

Willys Motors, Clark Equipment Co., and Electric Auto-Lite Co. are the latest concerns to sign contracts embodying the supplemental unemployment principle, which now covers nearly one million workers at more than 100 companies. The companies range from one with 46 employes to General Motors Corp. with 375,000 persons.

In addition to several fringe benefits, the Clark and Auto-Lite pacts include general wage increases. The Willys contract differs slightly, however, in that it does not provide an "across-the-board" wage hike. It was pointed out that Willys production workers have been receiving about 6.8 cents an hour extra under a bonus plan which will continue under the new contract.

Skilled workers, on the other hand, got an eight-cent-an-hour increase, in addition to fringe benefits. The union reportedly did not ask for a general wage increase because it felt the company's profit position had not reached a point where it could meet such a demand.

White Offers 9000 Tractor Line In Gas Models With 90-In. Cab

White Motor Co. has announced that its "9000" line is now in production in both gasoline and Diesel models. It is designed to meet size and weight restrictions in those states that have maximum allowable GVW determined by the "L" dimension (front tractor axle to rear trailer axle).

The new 9000 series for "L" states features a 90-in. dimension from front-of-bumper to back-of-cab. First introduced a few months ago in a Diesel version, the White "9000" Line now offers, in addition to the Diesel, a choice of four new White Mustang gasoline engines with 145-hp, 160-hp, 190-hp, and 215-hp ratings.

The shortened dimensional tractor

Engine accessibility in the White "9000" is shown above. The front fender is removable quickly, and the mechanic has full access to engine and accessory units because of the new tilted positioning.

can accommodate a 35-ft high-cube trailer with a wide range of kingpin locations and remain within the 45-ft overall length limit or a 40-ft trailer within the 50-ft overall length limit. Front axle, springs, steering gear, and frame are engineered to handle loading up to 11,500 lb with complete safety.

The new Mustang engines feature an improved cylinder head, almost double the depth of the previous design, a new four-barrel carburetor, water-jacketed intake manifold, larger lubricating oil and water coolant pumps, alloy steel crankshaft, manually controlled air filtration system, and several other refinements. The 9000 line is also available with the Cummins JT6B Diesel engine and the new PT Diesel fuel injection system.

Two steel cross-members anchored with brackets to the chassis side rails are "saddle"-mounted to support the cab, transmission, fuel tanks, battery, tool compartment, combination step, and the rear of the front fenders. Three of the four pivot-points supporting the cab and upper sheet metal structure are located on these cross-members. Together with the single mounting at the front of the chassis, these cross-tube mountings keep road shock and vibration from being transferred to the cab.

Turbine-Powered Helicopter Is Demonstrated by Piasecki

Said to be the world's largest turbine-powered transport helicopter, the 40-passenger YH-16A "Turbo Transporter" was demonstrated for the first time in public at Philadelphia International Airport early this month.

Designed and built by Piasecki Helicopter Corp., the craft is powered by two XT-38 Allison shaft turbines. The plane weighs over 16 tons and has a fuselage 77½ ft long.

Transmissions for the helicopter were built by Steel Products Engineering Div. of Kelsey-Hayes Wheel Co., and aluminum rotor blades were supplied by Aluminum Co. of America. Cleveland Pneumatic Tool Co. designed and produced the landing gears, while four main wheels and single-disk brakes and twin auxiliary tail wheels were manufactured by the Aviation Products Div. of Goodyear Tire & Rubber Co. Production version of the craft—the YH-16B—will be powered by two Allison T56 turboprop engines.

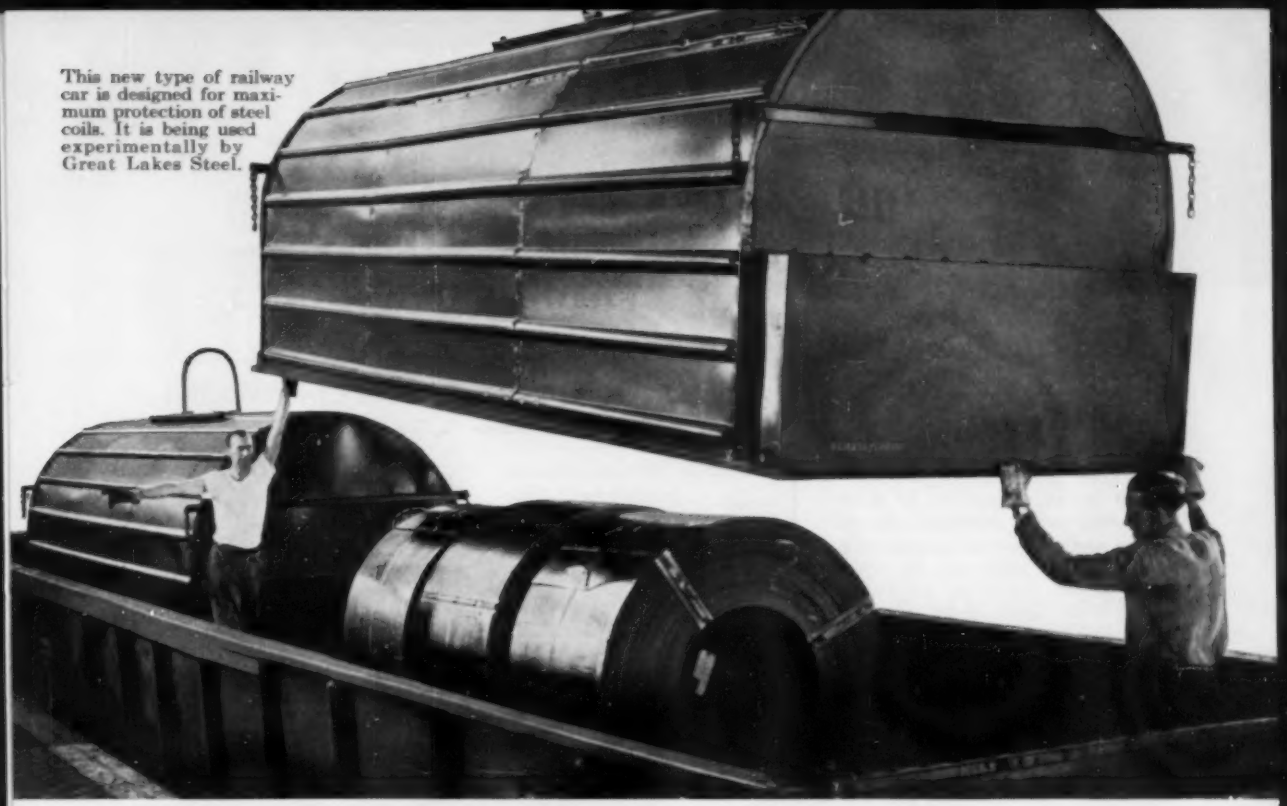
Designed to carry 69 troops, the YH-16B will have a greater payload and a higher speed than the YH-16A.

Kaiser Aluminum Undertakes New $280 Million Expansion

Kaiser Aluminum & Chemical Corp. has announced a new $280 million expansion program that will bring its total primary aluminum capacity up to 654,000 tons per year. The company will, upon completion of the program, be the nation's second largest aluminum producer, it is stated.

Major projects will be construction of a 220,000-ton aluminum reduction plant at Ravenswood, W. Va., and a 500,000-ton alumina plant near Gramercy, La. The new expansion program also provides $100 million for chemical facilities and a broad range of additional mill fabricating facilities.

Continued on Page 102



This new type of railway car is designed for maximum protection of steel coils. It is being used experimentally by Great Lakes Steel.

How Great Lakes Steel *delivers* quality

Another order receives individual attention as sheets of steel are wrapped with a waterproof covering and banded to meet the customer's specifications.

Steel coils (below) are securely blocked on a truck and trailer at Great Lakes Steel. Heavy tarpaulin cover is provided by truckers as standard equipment for additional protection.

The emphasis on quality at every stage of production at Great Lakes Steel extends right on through to the Delivery Department. There, careful attention is given to handling and packaging each coil and bundle to make sure that the customer receives his order in prime condition.

The Delivery Department has another important responsibility, too. It must see that our products reach each customer in ample time to meet his production schedules.

For quality with service—that extends all the way from the beginning of our operations to the end of yours—call on Great Lakes for your flat-rolled steel requirements.

GREAT LAKES STEEL CORPORATION

Ecorse, Detroit 29, Michigan • A Unit of

NATIONAL STEEL CORPORATION

District Sales Offices: Boston, Chicago, Cincinnati, Cleveland, Grand Rapids, Houston, Indianapolis, Lansing, Los Angeles, New York City, Philadelphia, Pittsburgh, Rochester, St. Louis, San Francisco, Toledo, Toronto.

News of the AUTOMOTIVE AND AVIATION INDUSTRIES

Continued from Page 100

Automotive Applications Win Attention in ACRI Displays

Held in an atmosphere of confidence that sales of both air conditioning and commercial refrigeration equipment will pass the $1 billion mark in 1955, the recent Air Conditioning & Refrigeration Industry Exposition in Atlantic City, N. J., drew some 15,000 visitors. A total of 252 companies exhibited some 6000 pieces of equipment and parts valued in the neighborhood of $3 million.

Air conditioning for the automotive field played an important role in the show with quite a few new items for use in passenger car cooling units as well as refrigeration systems for transporting perishables by truck. Indicative of the bright future seen for automotive air conditioning was the statement by C. E. Bucholzer, president of the Chrysler Airtemp Div., that Airtemp car air conditioner production for 1956 will be 50 per cent greater than that of 1955.

Featured in the display of Copeland Refrigeration Corp. was a four-cylinder, high-speed, belt-driven compressor designed especially for automotive air conditioning systems, while A-P Controls Corp. had on hand a 1956 car equipped with an air conditioning system utilizing its controls. Airserco Manufacturing Corp. demonstrated its new refrigerant charging equipment for automotive air conditioning service, and Tecumseh Products Co. presented a cutaway model of its automotive compressor.

Mobil-Aire Mfg. Co. had an underdash automobile air conditioning unit with a Warner electric clutch on display.

Kold-Hold Div. of Tranter Manufacturing, Inc., featured a line of Kold-Trux units for over-the-road refrigeration in truck and trailer bodies, and Union Asbestos & Rubber Co. showed a new mechanical refrigeration unit for door-to-door retail trucks carrying perishable commodities. The largest self-contained air conditioner in the show was the trailer-mounted G-2 unit of Keco Industries, Inc.; it is driven by a six-cylinder Continental engine, produces 11 tons of cooling, and is used principally for ground cooling of aircraft.

Included among the other exhibitors at the show and typical products shown were: Binks Manufacturing Co., industrial spray nozzles; Delco Products Div. of General Motors Corp., motors and hermetics; Detroit Controls Corp., automotive control valves and systems; Kinetic Chemicals Div. of Du Pont Co., Freon fluorinated hydrocarbon refrigerants; Electric Auto-Lite Co., recording instruments; Fasco Industries, Inc., split capacitor motors; and General Electric Co., horizontal packaged air conditioners and various motors.

Also: Lamb Electric Co., shaded pole motors; Linde Air Products Co., welding and cutting equipment; Peerless of America, Inc., automotive air conditioning evaporator and condenser coils; Redmond Co., Inc., fractional horsepower electric motors and blower units; Rochester Products Div., General Motors Corp., steel tubing; Square D Co., motor controls; Sun Oil Co., lubricants; Texas Co., lubricants; Torrington Manufacturing Co., blower wheel line; and Wagner Electric Corp., polyphase squirrel-cage motors.

TRUCK SALES INCREASE 20 PER CENT OVER 1954

1955 U. S. Motor Vehicle Factory Sales*

	Passenger Cars	Trucks	Buses	Totals 1955	Totals 1954
January	635,513	89,676	190	725,379	561,134
February	677,705	67,061	176	744,942	534,145
March	791,280	102,992	325	894,597	633,064
April	753,434	127,987	519	881,940	631,709
May	721,139	127,941	313	849,393	560,611
June	647,858	119,215	309	767,182	686,676
July	658,736	109,589	256	768,621	530,415
August	620,610	95,119	434	716,163	521,400
September	467,845	91,894	223	559,962	389,942
October	505,177	96,610	469	601,256	257,706
Total—Ten Months	6,479,987	1,026,984	3,254	7,509,335	5,247,101

1955 U. S. Motor Truck Factory Sales by G.V.W.*

	5,000 lb. and less	5,001–10,000	10,001–14,000	14,001–16,000	16,001–19,500	19,501–26,000	Over 26,000	Total
January	42,396	15,965	4,989	10,489	4,743	3,907	3,927	89,676
February	30,036	11,277	2,945	11,911	3,675	3,985	4,222	67,061
March	46,616	18,275	4,185	19,178	4,384	3,241	4,963	102,992
April	61,365	22,178	4,834	23,779	5,416	4,231	6,184	127,987
May	60,267	21,721	5,149	24,420	5,406	3,734	6,222	127,941
June	52,720	20,753	4,106	22,877	7,709	4,393	6,658	119,215
July	46,363	18,813	3,711	22,164	6,753	4,221	5,564	109,589
August	41,462	16,015	3,208	19,467	5,993	3,470	5,519	95,119
September	46,828	15,845	3,125	14,480	4,311	2,726	4,767	91,894
October	50,623	17,666	3,770	12,299	3,767	2,381	5,063	96,610
Total—10 Mos. 1955	482,916	177,427	38,781	187,072	53,252	34,497	53,057	1,026,984
Total—10 Mos. 1954	392,550	154,496	31,840	162,267	38,937	38,781	33,831	853,002

* Automobile Manufacturers Association.

Safety Belt Association Formed by 71 Companies

Since practically every car producer is now offering safety seat belts on automobiles, many equipment manufacturers are taking advantage of the sales potential for the belts and jumping into the business. Not all of these companies, however, have adequate facilities for testing their merchandise.

In order to prevent unscrupulous persons from peddling sub-standard belts, a group of 71 safety equipment manufacturers have joined together to form the National Association of Automotive Safety Belt Manufacturers. Headquarters are in Chicago.

(*Turn to page* 104, *please*)

NOW 400% LONGER CLUTCH LIFE

plus 100%
more torque capacity

plus 50%
more heat resistance

....thanks to
BORG-WARNER'S ROCKFORD CLUTCH *engineering*

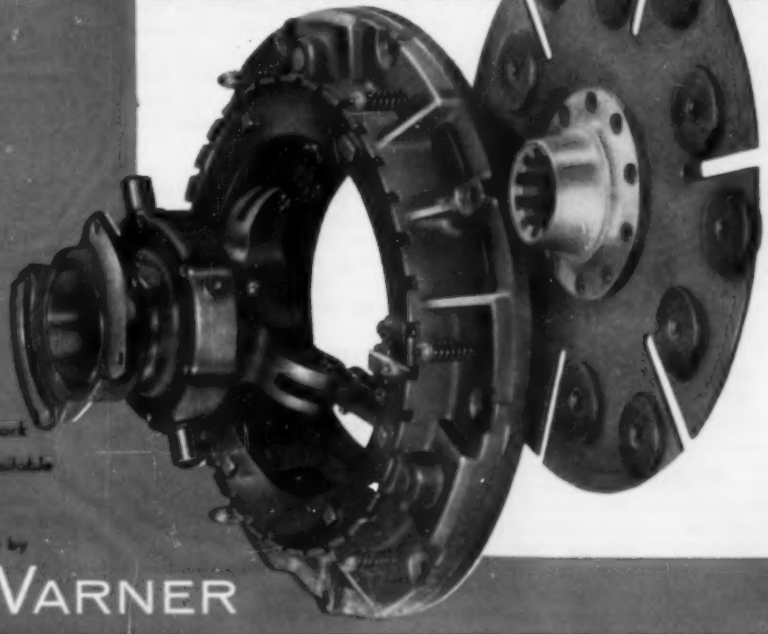
Clutches take a terrific beating in heavy duty operation on trucks, tractors, bulldozers, graders, shovels, cranes and similar machinery. They've got to be really rugged to stand up under the strain of constant engaging and disengaging, sudden starts and stops, heavy power loads. And the insistent demand is for longer life, more torque capacity, better heat disposal.

To achieve these results, Borg-Warner's *Rockford Clutch* Division has developed a new line of heavy duty clutches, incorporating a remarkable new type of facing material. Exhaustive field tests conclusively prove these new MORLIFE* clutches assure 400% longer life without adjustment or plate replacement . . . 100% more torque grip, permitting smaller clutch size and lighter pedal pressure . . . 50% more heat resistance to minimize down-time caused by burned or warped plates.

That all adds up to better operation, longer service life and more continuous on-the-job hours for heavy duty machinery.

And that's one more example of how Borg-Warner's "Design it better – make it better" tradition serves industry every day.

*TRADE MARK



ENGINEERING B-W PRODUCTION

B-W engineering makes it work
B-W production makes it available

†85 products in all are made by

BORG-WARNER

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Industry News

(Continued from page 102)

Napco Plans Added Expansion Of Federal Truck Operations

Early in 1956, Napco Industries, Inc., is expected to complete its current building program which will provide more than one-million sq ft of floor space under roof. Included will be the special facilities for producing Federal trucks entailing an expenditure of about $1 million for the cost of building and equipment.

Present plans call for producing two major lines of basic chassis. First will be the Styline series in the medium-duty field of two to five-ton capacities with GVW ratings from 19,000 lb. This series will range up to a 38,000-lb GVW with tandem axle or 28,000 lb GVW with conventional axle. The line will also include Diesel engine models.

In the heavy-duty category, Napco will produce the Federal Golden Eagle series ranging from 30,000 lb GVW to above 60,000 lb GVW, including off-highway vehicles of the largest sizes made. This series will also offer a choice of drives and optional power steering.

Sales plans are being developed for distribution nationally through exclusive distributors who, in turn, are free to work with selected dealers in their territory. It is claimed that Federal always enjoyed a good following in the export field and more intensive coverage of world-wide export markets is one of the major objectives of the current program.

In the domestic truck field Napco intends to concentrate upon basic Federal chassis with suitable modifications and such special mechanisms and equipment as are required to meet the needs of specialized vehicles for various applications such as public utilities, logging, dump trucks, cranes, tractors, etc. The company is said to feel that the specialized field with its lower volume is less competitive and offers better opportunities.

Erratum

The author's byline was inadvertently omitted from the article entitled "Soviet Systems for Design and Production of Aircraft" appearing on page 62 of the September 15 issue of AUTOMOTIVE INDUSTRIES. Credit for the story should go to Valentin I. Tsonev, Research Associate in the Institute in Social Science, University of North Carolina, Chapel Hill, N. C.

Tuthill Pump Co.—A. L. Coney has been made general sales manager.

Motor Wheel Corp.—Carl F. Schultz was elected vice-president of automotive sales.

MEN *in the* NEWS

(Continued from page 41)

Square D Co., Distribution Equipment Div.—**Grant McDonald** and **Anthony Kasker** have been named manufacturing manager and controller, respectively.

Machine Products Corp.—**John C. Terry, Jr.**, has joined the organization as chief engineer.

E. W. Bliss Co., Rolling Mill Div.—**Edmund Shuster** is now chief European sales engineer.

Republic Aviation Corp.—**Maj. Gen. (ret.) Alden R. Crawford** has been elected vice-president for operations in Europe.

Oldsmobile Div., General Motors Corp.—**Victor H Sutherlen** has been appointed assistant sales manager in charge of the western U. S. **George C. Clemeson** succeeds him as Southwest regional manager, and **H. J. O'Connell** has become Chicago zone manager.

American Bosch Div., American Bosch Arma Corp.—**Richard S. Jay** has become assistant to the vice-president of sales.

Ajax Electric Co.—**Edward N. Case** has been named sales manager.

Jervis B. Webb Co.—**Joseph A. Lynch** is now sales engineer in the Detroit area.

Petro-Mechanics Research Div., Borg-Warner Corp.—**A. W. Rose** is now vice-president and general manager.

Convac Div., Consolidated Engineering Corp.—**Howard C. Jones** is now appointed director of manufacturing.

AI TABLOID

(Continued from page 37)

Glenn L. Martin Co. reportedly plans to build an aircraft plant with 500,000 sq ft of floor space on a 4000-acre tract near Denver, Colo.

* * *

Elwell-Parker Electric Co. celebrates its 50th anniversary of industrial truck production in 1956.

* * *

Tyson Bearing Corp. has established a new Automotive Div. . . . L.O.F. Glass Fibers Co. has created a new Automotive Sales Div.

* * *

Houdaille Industries, Inc., is the new name of Houdaille-Hershey Corp.

* * *

Solar Aircraft Co. has received a new multi-million dollar order from Lockheed Aircraft Corp. to build stainless steel airframe components for a forthcoming version of the Super Constellation.

* * *

Black & Decker Mfg. Co. has formed a South African subsidiary company with headquarters in Johannesburg . . . Republic Steel Corp. has formed an International Projects Div.

* * *

The Metal Processing Div. of Curtiss-Wright Corp. has begun work in its new extrusion press plant at Buffalo, N. Y.

* * *

Hamilton Standard Div. of United Aircraft Corp. has announced plans for a major expansion program at Windsor Locks, Conn. . . . American Chain & Cable Co., Inc. has disclosed plans for a $500,000 addition to its factory at Adrian, Mich.

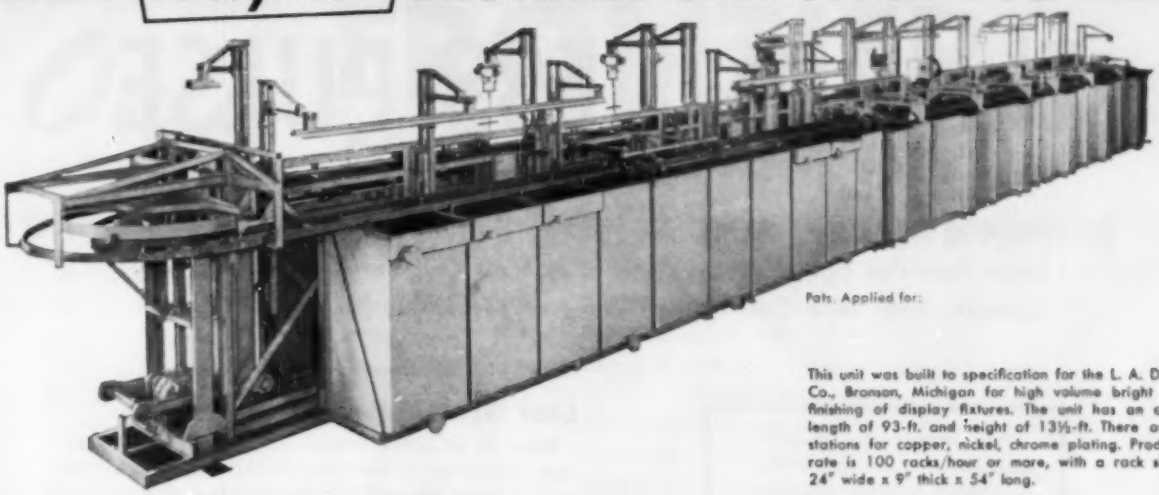
* * *

Illinois Tool Works has moved its Detroit sales office to new quarters at 1403 East State Fair.

* * *

Piasecki Helicopter Corp. is said to be negotiating a contract for production of its helicopters in Germany . . . Dow Chemical Co. and Kilachand, Devchand & Co., Ltd., of India have formed a company to manufacture Styron polystyrene plastic for Indian molders.

ONLY Wagner BROTHERS CAN OFFER YOU THIS

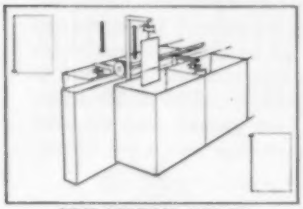


Pats. Applied for:

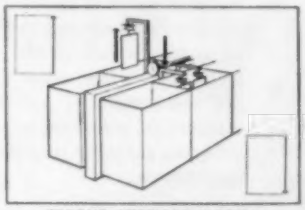
This unit was built to specification for the L. A. Darling Co., Bronson, Michigan for high volume bright metal finishing of display fixtures. The unit has an overall length of 93-ft. and height of 13½-ft. There are 27 stations for copper, nickel, chrome plating. Production rate is 100 racks/hour or more, with a rack size of 24" wide x 9" thick x 54" long.

Revolutionary Concept in plating automation...

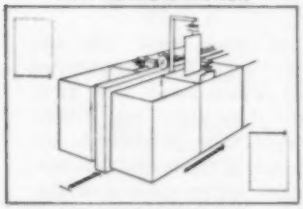
The Wagner Brothers Automatic is a complete and fully automatic mechanism, incorporating a revolutionary vertical transfer and return type work conveying principle which eliminates elevating superstructure, transfer cams, chains and sprockets and hydraulic cylinders above tanks. Many unique design features combine to make this mechanism a smooth operating, perfectly timed unit requiring less than ½ the power of comparably sized units.



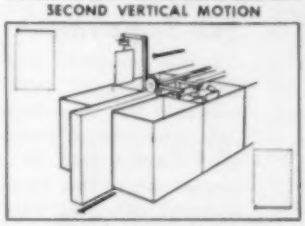
FIRST VERTICAL MOTION



SECOND VERTICAL MOTION



FIRST HORIZONTAL MOTION



SECOND HORIZONTAL MOTION

HOW IT WORKS

All transfer and conveying mechanism is mounted on a reciprocating carriage located between the two rows of tanks. Two basic movements are used to bring parts through the full plating cycle; one forward and reverse straight line horizontal motion and one raising and lowering vertical movement.

Plating racks are attached to work-carriers at the loading station. When the machine is started, lifting arms fixed to the carriage engage the work-carriers being transferred and lift them at all transfer points on one side of the machine, carry them forward to the next station where they are lowered and disengaged from the lifting arm. This sequence is simultaneously produced in reverse on the opposite side so that, when the lifting arms are being lowered on one side, they are raised on the other side.

ADVANTAGES

SMOOTH OPERATION—Operates so smoothly that you can balance a full water glass on the transfer mechanism throughout the entire plating cycle. Obviously such smooth operation will save you time now spent salvaging parts from tanks; dropped there because of the jolting transfer action of ordinary machines. This smooth, positive performance is accomplished because of our hydromotor principle which makes each start and stop gentle as a breeze.

LOW POWER REQUIREMENTS—Powered by one 10 hp motor, this installation uses less than half the power required by comparably-sized units. This is possible because of the almost perfect balance of work load being lifted at one time.

SIMPLE INSTALLATION—Your Wagner Brothers Automatic is delivered to you, either intact or in two or three completely assembled sections, depending upon size. Installation is simply a matter of positioning and leveling.

MINIMUM OF MAINTENANCE—There are few moving parts to wear, no vibrating parts, no backlash in automation, nor little chance of misalignment. Overload protection is given by a by-pass in the hydraulic pump. All working parts can be reached for adjustment without disassembly.

OTHER PLUS FEATURES—Wagner Brothers Automatics require a minimum of space. The model illustrated uses 54-inch racks and operates under a 13½-ft. ceiling. There are no greased parts or hydraulic fittings over tanks where dripping oil could contaminate solutions. Triple contacts on cathode bars afford consistent, uninterrupted current flow. Automatic heat control system gives simple, foolproof regulation of temperature for accurate results. Centralized lubrication can be provided as an optional feature. Drag and dwell times are easily varied with this unit. **Write for free, illustrated folder.**

In addition to high-volume plating, the Wagner Brothers' Automatic is equally well-suited to anodizing (sulphuric and chromic), phosphate coating, etching, electropolishing, oxide coating.

YOUR *PRIMARY* SOURCE FOR PLATING AND POLISHING EQUIPMENT AND SUPPLIES

Wagner BROTHERS, INC.

437 MIDLAND AVE. • DETROIT 3, MICHIGAN

The BUSINESS PULSE

Mounting Bullish Psychology Causes Further Tightening of Monetary Policy. Large Expansion Plans for 1956 Unveiled by Many Corporations. Government Estimates Point to a Construction Outlay of $44 Billion During Next Year.

This Survey Is Prepared Exclusively for AUTOMOTIVE INDUSTRIES by the Guaranty Trust Company of New York.

Tighter Money

Monetary policy has been tightened again. On November 17 six Federal Reserve banks increased their rediscount rates from 2¼ to 2½ per cent, and within a week the other six had followed suit. This was far and away the outstanding event of the past month in the realm of economic affairs.

Officials, as is their custom, offered no explanation as to why they had decided to act, but one was hardly needed. Clearly the step signified that authorities were not satisfied that the restrictive measures previously taken had freed the boom of all its excesses.

While the Federal Reserve's action took some observers by surprise, it is noteworthy that the increase would have been a far greater surprise had it been instituted a month earlier than it actually was. This is because during October both Administration and Treasury officials gave the impression of being reasonably well satisfied with the anti-inflationary measures that had been taken to that point. In last month's "Business Pulse" Dr. Arthur F. Burns, chairman of the President's Council of Economic Advisers, was quoted as saying that "we have succeeded in keeping them [the excesses of the boom] in check," and it was observed that Federal Reserve officials did not appear disposed to take further restrictive actions.

What happened in the interim? One month is too short a time, of course, for economic conditions to change fundamentally. Nevertheless, there were some market developments during the period that pointed to mounting bullish psychology, and even more important, there were a number of disclosures regarding business plans for 1956 that suggested the real possibility of an intensification of the pressure on resources.

Lost Ground Regained

First of all, stock prices staged a vigorous comeback beginning in late October that regained all the ground lost in the selling wave following the announcement of President Eisenhower's illness. This recovery strongly indicated that general confidence had not been essentially affected, at least for the time being. The recovery also put Federal Reserve officials on notice that the President's illness would not, in itself, act as an important restraining factor on the boom.

This impression was reinforced by the continuing forward surge of industrial and commercial operations in late October and early November. There was no letup whatsoever in the high tempo of productive activity but rather some further acceleration owing to the resurgence of automobile output. Retail trade, meanwhile, remained on a high plateau, with virtually all signs pointing to a new all-time record for Christmas volume.

Full Empoyment

Labor resources, for one thing, were fully employed, practically speaking. Census Bureau estimates indicated that more than 65 million people were gainfully employed in October. Only about two million were estimated to be jobless, with presumably the largest part of this idleness due to "frictional" factors. Material resources were also under obvious strain. Current demands for such commodities as steel, copper, and lead simply could not be fully met, with the result that "gray-market" offerings, particularly for steel, were being reported with increasing frequency. Business loans, moreover, continued to rise through October at a greater-than-seasonal pace, while consumers apparently continued to add to their debt in substantial amounts. This credit expansion, coming at a time when resources were already being strained, was reflected in price pressures in strategic areas.

In short, events of late October and early November clearly demonstrated that the economy was close to, if not at, the "full-employment ceiling." Perhaps it might be protested that this was the situation a month earlier when the Federal Reserve did not act. While this is essentially true, there was one significant difference between the two situations. Earlier there had

(*Turn to page* 144, *please*)

Only FRONTIER
40-E Aluminum Alloy

with this composition* can give you these average properties

Zn —5.0 —6.0	Cu — .30 Max.
Mg — .50— .70	Si — .25 Max.
Cr — .40— .60	Mn — .30 Max.
Ti — .15— .25	Al —Remainder
Fe —1.0 Max.	

* Protected by Comstock Patent 2146330. Alloy Data Booklet will be mailed free, giving complete story on 40-E Alloy. Write for your copy — today!

Yield Point — 30,000 lbs.
Tensile Strength — 37,000 lbs.
Elongation . . . 5%
Shock Resistance — Withstands direct and transmitted shock
Corrosion Resistance even in stressed condition
Excellent Machineability
Fine Grain. Withstands High Pressure.
No Heat Treatment Necessary.

Here's what happens when attempts are made to develop an Aluminum-Magnesium-Zinc Alloy *without infringing on the FRONTIER 40-E Patent*

- Copper Increased . . . . RESULT: Embrittles the alloy, reduces the elongation and tensile strength and increases stress corrosion.
- Silicon Increased . . . . RESULT: Reduces all physical properties.
- Manganese Increased . . RESULT: As manganese is increased over 0.4% the elongation and tensile strength are relatively reduced.
- Tin Added . . . . . RESULT: Yield Point and Tensile Strength reduced.
- Lead Added . . . . . RESULT: Additions of even small fractions of a percent have a decided effect on reducing tensile and yield strength.

NO Al, Zn, Mg ALLOY CAN MATCH FRONTIER 40-E ALLOY

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Use the BEST! Use FRONTIER 40-E

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Please send me a copy of the Alloy Data Book giving engineering and metallurgical Facts on the physical properties of Frontier "40-E".

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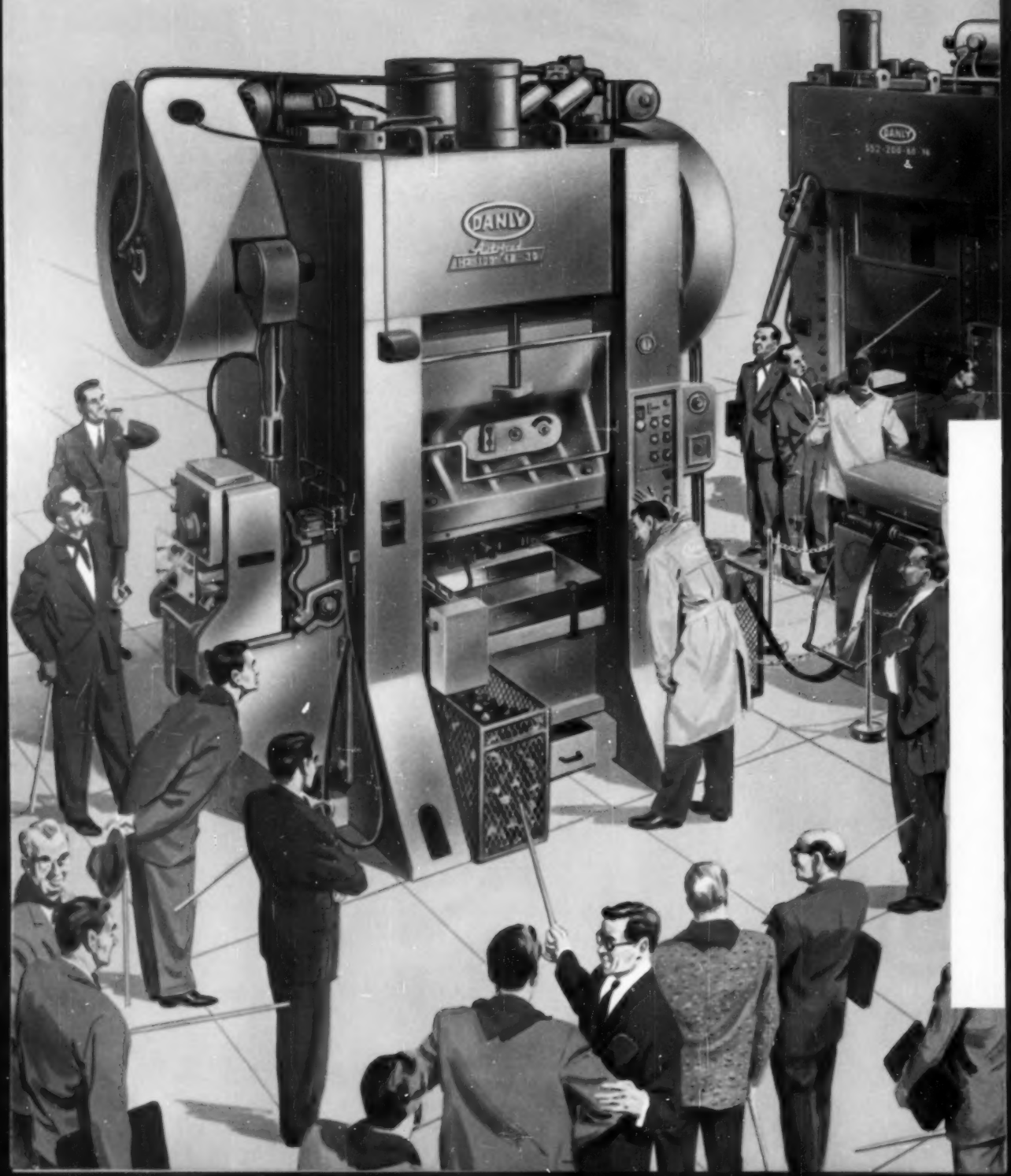


tool show compared

. . . AND SAW WHY

IT COSTS LESS TO RUN A DANLY PRESS

Manufacturers, engineers, machine tool users and industrial leaders from all parts of the world watched Danly Presses and equipment operate at the Machine Tool Show in Chicago. They saw working demonstrations of Danly operational features . . . inspected advanced Danly design and construction . . . found out first-hand *why* increased production costs less with Danly Presses.

The Danly Autofeed Press exhibited represents the most advanced thinking in high-speed stamping press design . . . duplicating the actual results *you* can expect in your own plant. Vibration-resistant construction, built-in press controls, operator and press safety devices built into this press result in direct savings in maintenance and operating costs. Machine tool precision and substantially heavier construction throughout are basic reasons why Danly Autofeed Presses will give you greater production from your progressive dies . . . why this exhibition press turned out stampings from a seven station die at the rate of over 3,000,000 per month. This figure represents the number of rifle clips actually being produced, month after month, in a production plant from an identical die on a similar Autofeed Press.

These same Danly advantages will produce substantial savings in your operations. Use the comparison list shown here to check Danly Presses, feature for feature, against all other presses. *Discover for yourself why Danly Presses mean* increased production at lower operating costs. Talk to a Danly engineer *soon. Write for the completely new Danly Autofeed Press Catalog now!*

WHY DON'T YOU COMPARE DANLY PRESSES, FEATURE FOR FEATURE, WITH ALL OTHER PRESSES ON THE MARKET?

THIS IS THE SEVEN STAGE PROGRESSIVE DIE THAT PRODUCES RIFLE CLIPS AT THE RATE OF OVER 3,000,000 A MONTH. EXTREMELY CLOSE ALIGNMENT OF OIL LUBRICATED SLIDE GIBS AND EXTRA-RIGID CONSTRUCTION OF DANLY PRESSES PROTECT DIES SUCH AS THIS, ASSURING LONGER LIFE.

COMPARE	FEATURE	DANLY	OTHER	
PRECISION	Machine tool precision in manufacture and assembly plus adequate lubrication assure smoother operation, longer life.	✓		
INSTALLATION COSTS	Danly presses are delivered already "run-in" tested. Assembly and operation in the Danly plant means fewer adjustments, faster installation.	✓		
DRIVE	Danly's cool-running clutch lasts longer. Herringbone type gears and anti-friction bearings on high speed shafts wear longer.	✓		
CONSTRUCTION	Extra-heavy construction reduces vibration and deflection. Dies last longer, presses stand up under severest duty.	✓		
LUBRICATION	Danly features completely automatic oil lubrication including slide gibs. Should any vital bearing not be sufficiently lubricated, safety switch stops press and indicates the source of trouble.	✓		
MAINTENANCE	Performance records in the country's biggest stamping shops prove that Danly Presses require less maintenance, greatly reduce spare part needs.	✓		
CONTROLS	Controls designed and built by the press manufacturer assure the user of undivided, one-source responsibility for control and press performance on the production line.	✓		

DANLY®

DANLY MACHINE SPECIALTIES, INC.
2100 South Laramie Avenue · Chicago 50, Illinois

Here's the secret of Micronic*-type Purolator's

HIGH FLOW RATE

This little Purolator filter element can clean a quart of dirty lube oil in 60 seconds. It takes out sludge and solid impurities as small as one micron (.000039-inch) yet leaves beneficial additives unaffected. It operates with minimum pressure drop and a standard-size oil pump.

You can see the secret at the left. It's the Purolator Micronic element. This accordion-pleated, resin-impregnated element provides ten times the filtering area of older elements. This means faster filtration rates and far greater dirt storage capacity.

To designers and users of automotive equipment, Micronic-type Purolators offer thorough filtration by a small, compact unit that fits snugly into the lubricating system without needing an oversized pump to boost pressures through the filter. These advantages of Micronic filtration are among the many reasons why original automotive equipment manufacturers use more Purolators than any other type of filter.

Micronic elements do not channel. They are waterproof and warp-proof and remain unaffected by engine temperatures. There's a Purolator to fit every vehicle, tractor, and other gasoline- or diesel-engine-powered unit in service today. Write for our automotive catalog, No. 2054, to Purolator Products, Inc., Rahway, N. J., Dept. A3-1216.

*Registered Trade Mark

PUROLATOR

"FIRST IN THE FIELD OF FILTERING"

Spring Steel

by SUPERIOR

for the

uniform behavior

you require

in fabrication!

in service!

Uniform, dependable response to your manufacturing processes and subsequent service requirements is outstanding in SUPERIOR Spring Steel. We build uniform behavior into every coil, from specified analysis of composition to final anneal before shipment. We're strip steel specialists: *you gain by it.* Specify SUPERIOR for your spring steel needs!

Superior Steel

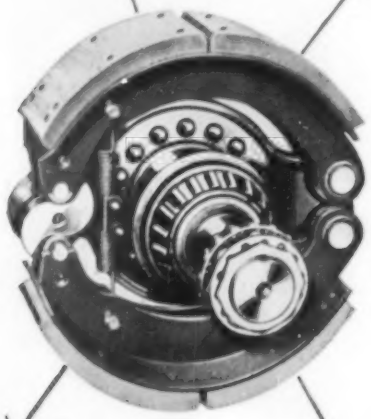
CORPORATION

CARNEGIE, PENNSYLVANIA

IF IT MOVES WE CAN STOP IT!

TDA BRAKES

...for every industrial or automotive application where braking is required!



P SERIES POWER BRAKES

designed for heavy-duty automotive service

These rugged, heavy-duty power brakes are designed to give longer troublefree service on trucks, truck-tractors, trailers, buses, trolley-coaches and industrial and road equipment.

Superior design has made Timken-Detroit's "P" Series brakes the undisputed choice of leading vehicle manufacturers everywhere. Operating temperature is reduced sharply, cutting the biggest cause of brake wear. Other important features of the "P" Series brakes offer increased economy and performance for operators.

"P" Series power brakes are available in a complete range of capacities and sizes . . . to meet every operating need.

For additional information . . . with expert consultation, contact the Timken-Detroit Brake Division. Complete details and specifications on the "P" Series brakes are available. And, a staff of highly experienced engineers can assist you with any brake problem that you may have.

Easy accurate brake adjustments

Slack adjusters permit quick, simple adjustments. When adjustment is made, spring-loaded lock automatically engages adjustment screw to prevent screw backing off during service.

Cooler running

Open-type, malleable iron brake spiders eliminate air pockets and assure adequate internal ventilation for cooler running.

Constant Lift "S" Type Cam

Constant lift "S" type cam assures uniform application of brake shoes for maximum sensitivity and controllability.

Longer liner life with "Econoliner"

Timken Detroit *Econo*-liners are tapered to provide greater strength and thickness at the center where wear is greatest.

Better brake drums

Sturdy, rugged brake drums are designed to supply maximum rigidity with rapid heat dissipating ability.

TIMKEN Detroit BRAKES

TIMKEN-DETROIT BRAKE DIVISION
ROCKWELL SPRING AND AXLE COMPANY
NORTHBRIDGE, OHIO

Accepted Standard

Plants at: Detroit, Michigan • Oshkosh, Wisconsin
Utica, New York • Ashtabula, Kenton and Newark, Ohio
New Castle, Pennsylvania

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More Government Contract Awards

THIS latest list of Government prime contracts that have been awarded covers the period from Oct. 31 to Nov. 21, 1955. Items included in this list are for various types of automotive military equipment, including tanks, motorized gun carriages, trucks, airplanes, automotive components and spare parts, automotive maintenance equipment, etc.

AINSWORTH MANUFACTURING CO., Detroit, Mich.
Auto spare parts—2717 ea.—$67,938

ALCO PRODUCTS, INC., Renewal Parts Dept. Schenectady, New York
Cylinder head assemblies—24 ea.—$27,600

ALUMINUM COMPANY OF AMERICA, Pittsburgh, Pa.
Facilities for the production of aircraft forgings—$100,000

THE AMERICAN WELDING AND MANUFACTURING CO., Warren, Ohio
Facilities for production of J-65, J-57 and 7-73 engine components—$71,870

BELL AIRCRAFT CORPORATION, Buffalo, New York
Facilities—$200,000

BENDIX AVIATION CORP., Bendix Products Div., South Bend, Ind.
Conduct a study program on spray cooled brakes—$25,813
Maintenance parts—Various—$25,831
Control assys.—374 ea.
Carburetors—54 ea.—$74,908
Master control—126 ea.—$179,900

BENDIX AVIATION CORP., Scintilla Div., Sidney, New York
Ignition harness assys.—408 ea.—$129,948
Maintenance parts—$38,009

BOEING AIRPLANE COMPANY, Wichita, Kansas
Maintenance of aircraft—$1,514,733

BOEING AIRPLANE COMPANY, Seattle, Washington
Wheel, turbine, bladed, main feed pump—$29,420

BORG-WARNER CORP., Marvel-Schebler Products Div., Decatur, Ill.
Control drive mechanism—3 ea.—$115,500

BORG-WARNER CORPORATION, Pesco Products Div., Bedford, Ohio
Maintenance parts for Holley fuel controls—Various—$59,446

BREEZE CORPORATION, INC., Union, New Jersey
Actuators and shafts—Various—$117,962

THE CLEVELAND PNEUMATIC TOOL CO., Cleveland, Ohio
Piston used on strut, assy.—45 ea.—$40,919

CONTINENTAL AVIATION & ENGINEERING CORP., Detroit, Mich.
Tools for YJ69-T-9 engines—$125,000

CONTINENTAL MOTORS CORP, Detroit, Mich.
Engine spare parts—8816—$511,850
Development of a 20 hp military engine—$388,592
Design engine generator sets—$6681

CURTISS-WRIGHT CORP., Electronics Div., Carlstadt, New Jersey
B-52D flight simulators, spare parts, special tools and ground handling equipment—$500,000

DOUGLAS AIRCRAFT COMPANY, INC., Santa Monica, Calif.
Maintenance parts—Various—$88,507
Heater assys.—Various—$43,148

EATON MANUFACTURING CO., Eaton Aircraft Div., Battle Creek, Mich.
Facilities for the production of titanium compressor blades for J-57 and J-75 engines—$4,640,000

ELECTRO-MECHANICAL PRODUCTS CO., Garden City, Mich.
Engine spare parts—18,709—$523,947

FARGO MOTOR CORP., Washington, D. C.
Automobiles—17 ea.—$23,756

FORD MOTOR COMPANY, Ford Div., Washington, D. C.
Light trucks—207 ea.—$255,408
Trucks—18 ea.—$57,441
Automobiles—10 ea.—$13,388

FORD MOTOR COMPANY, Dearborn, Michigan
Modification of 168 20MM weapons—Job—$303,830

FORD MOTOR COMPANY, Ford International, New York, N. Y.
Automobiles—8 ea.—$11,100

(Turn to page 114, please)

CUT COSTS . . . FASTEN "ON THE DOUBLE" with the Chicago "214" DOUBLE RIVET SETTER

The "214" automatically feeds, inserts and clinches two rivets at a time . . . with speed that may mean a big saving in your fastening costs.

14" throat makes large assemblies easy to handle. For up to 9/64" diameter steel tubular rivets—lengths to 7/8". Quick Change Rotary Type Hoppers and Raceways permit a 5-minute changeover to rivets of different size. Adjustable anvils and riveting centers add to its versatility.

Ask us how the "214" can help you cut costs. Send a sample of your problem assembly (or blueprint) for a Free fastening analysis.

FREE CATALOG

contains valuable engineering information and rivet specifications plus illustrated descriptions of 26 Chicago Automatic Rivet Setters.

Chicago Rivet & MACHINE CO.

9612 West Jackson Boulevard, Bellwood (Chicago Suburb) Illinois

Branch Factory: Tyrone, Pa.

"Just Over the Horizon"

EXECUTIVE PLANES
with C.A.E. Turbine Power

CONTINENTAL
J69

Compact, easily serviced. 920 lbs. thrust. Single-stage centrifugal compresser, single annular combuster, single-stage turbine; hollow-shaft fuel introduction provides excellent atomization and is non-clogging—eliminates need of high-pressure fuel system.

"The era of jet-powered business aircraft . . . undoubtedly is just over the horizon." . . . This is the conclusion* reached by Herb Fisher, Chief, Aviation Development Division, The Port of New York Authority, after flying the MS 760 twin jet executive transport which Beech Aircraft Corp. has been demonstrating in America this summer. U. S. version of the ship will be powered by Continental J69, raising the service ceiling to 35,500 feet and maximum speed to 410 mph. . . . This pioneer twin jet transport marks an important addition to the list of applications for which the J69 is admirably suited in performance characteristics, and design. The engine is now in production at C. A. E.

*See "Executive Pilot's Report: MS 760", Skyways, August 1955, P. 12.

CAREERS FOR ENGINEERS

Continental Aviation & Engineering Corp. has openings for technically-trained men. Engineers interested in positions with almost unlimited opportunity for advancement, in this new and challenging industry, are invited to write for information.

CONTINENTAL AVIATION & ENGINEERING CORPORATION
12700 KERCHEVAL AVENUE, DETROIT 15, MICHIGAN
SUBSIDIARY OF CONTINENTAL MOTORS CORPORATION

(Continued from page 113)

THE FOUR WHEEL DRIVE AUTO CO., Clintonville, Wis.
Plow, snow—2 ea.—$49,492
Trucks—1 ea.—$13,631

GENERAL DYNAMICS CORP., Convair Div., San Diego, Calif.
Design, development and fabrication of Azusa system—Job—$240,000

GENERAL ELECTRIC COMPANY, Schenectady, New York
Superchargers—56 ea.—$170
Repair parts for turbines—$78,976

GENERAL MOTORS CORP., Chevrolet Motors Div., Detroit, Mich.
Automobiles—27—$38,919
Light trucks—285—$315,470

GENERAL MOTORS CORP., Cleveland Diesel Engine Div., Cleveland, Ohio
Repair parts—7160 ea.—$54,385

GENERAL MOTORS CORP., Delco Products Div., Detroit, Mich.
Tank spare parts—1465 ea.—$45,657

GENERAL MOTORS CORP., Detroit Diesel Engine Div., Detroit Mich.
Propulsion engines and spare parts—10 pair—$80,301

GENERAL MOTORS CORP., Foreign Distributors, New York, N. Y.
Light trucks—6 ea.—$11,004

GENERAL MOTORS CORP., Pontiac Motors Div., Pontiac, Mich.
Modification of kits for M-76 amphibious cargo carrier—$131,780

THE GOODYEAR TIRE & RUBBER CO., INC., Akron, Ohio
Wheel, brake assys.—$424,826
Brake assys.—$174,124

HOLLEY CARBURETOR CO., Detroit, Mich.
Overhaul and modify main fuel controls—Various—$72,314

HUGHES TOOL COMPANY, Hughes Aircraft Div., Culver City, Calif.
Facilities for the production of prototype MA-1 interceptor and weapons control systems—$415,000

HYDRO-AIRE, INC., Burbank, Calif.
Maintenance parts—Various—$29,327

LEAR, INCORPORATED, Grand Rapids, Michigan
Actuator—Various—$58,671

THE GLENN L. MARTIN COMPANY, Baltimore, Maryland
Panel assys.—Various—$76,401

THE NEW YORK AIR BRAKE CO., Watertown, New York
Hydraulic pumps for FJ-3 aircraft—187 ea.—$91,654

NILES-BEMENT-POND CO., Chandler Evans Div., West Hartford, Connecticut
Carburetor parts—Various—$68,056

NORTH AMERICAN AVIATION, INC., Columbus Div., Columbus, Ohio
Maintenance parts—Various—$26,896

PACIFIC AERMOTIVE CORPORATION, Burbank, California
Valve assys.—34 ea.

REPUBLICAN AVIATION CORP, Farmingdale, L. I., New York
Repair of RF-84F aircraft—$139,608

(Turn to page 116, please)

CHROME RINGS

BY

Sealed Power

preferred by 28 leading engine builders

Sure, this is the age of chrome rings. But not just *any* chrome rings. Engine builders must be certain that the rings they use as original equipment can endure the heat, friction, abrasion and corrosion encountered in modern high speed motors.

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Leading Manufacturer of Automotive and Industrial Piston Rings since 1911
Largest Producer of Sealing Rings for Automatic Transmissions • Power Steering Units

(Continued from page 114)

RETT PRODUCTS COMPANY, Detroit, Michigan
Tank spare parts—250 ea.—$157,690

SOLAR AIRCRAFT CO., San Diego, Calif.
Generator set, gas turbine driven—1 ea.—$173,406

SOLAR AIRCRAFT COMPANY, Des Moines, Iowa
Acquisition and installation of facilities—$240,000

STANLEY AVIATION CORP., Denver, Colo.
Trainer, cockpit procedure F-84F-45—$283,178

STERLING ENGINE CO., Div. Sterling Precision Instrument Corp., Menominee, Michigan
Repair parts for Diesel engines—3606 ea.—$48,358

STUDEBAKER-PACKARD CORP., Detroit, Michigan
Repair parts for Diesel engines, crankshafts—20 ea.—$94,719
Tank spare parts—3633 ea.—$51,238

SUNDSTRAND MACHINE TOOL CO., Rockford, Ill.
Drives, constant speed—$442,984

THOMPSON PRODUCTS, INC., Accessories Div., Cleveland, Ohio
Pumps and spare parts—309 ea.—$77,400
Preparation of facilities for shipment—$300,000
Acquisition and installation of facilities—$1,427,750

TWIN DISC CLUTCH COMPANY, Racine, Wisconsin
Repair parts—12,165 ea.—$76,775

UNITED AIRCRAFT CORP., Hamilton Standard Div., Windsor Locks, Conn.
Propeller spares—$76,895

UNITED AIRCRAFT CORP., Sikorsky Aircraft Div., Bridgeport, Conn.
Facilities—$1,500,000

UNITED STATES RUBBER CO., Mishawaka, Indiana
Cell, fuel assembly—333—$72,594

VICKERS, INCORPORATED, Detroit, Mich.
Hydraulic pump and motor—Various—$70,086

WALTER MOTOR TRUCK CO., Ridgewood, L. I., New York
Plow, snow—4 ea.—$101,687

WESTINGHOUSE ELECTRIC CORP., Philadelphia, Pa.
Clutch pack assys.—1661 ea.—$38,286

RAY WHITE ELECTRIC PRODUCT CO., East Detroit, Michigan
Cable, spark plug assy.—$98,532

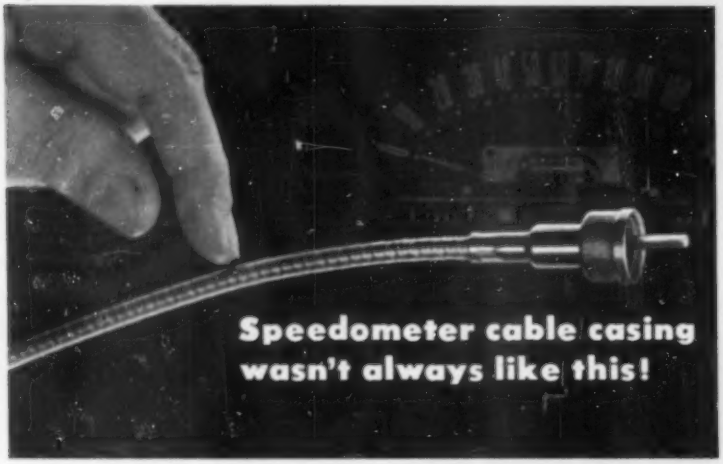
WILLYS MOTORS CORP., Washington, D. C.
Spare parts—1 lot—$17,381

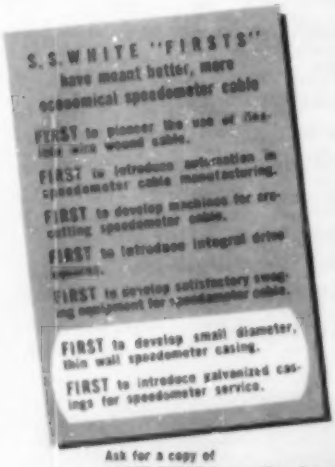
WILLYS MOTORS, INC., Toledo, Ohio
Trucks—88 ea.—$151,488

WORTHINGTON CORP., Harrison, N. J.
Repair parts—5325 ea.—$90,559
Repair parts for compressors—4245 ea.—$27,578
Repair parts for pumps and compressors—8870 ea.—$110,948

WRIGHT AERONAUTICAL DIV., Wood-Ridge, New Jersey
R-3350-34 engines, R-3350-26W 8 engines—$9,019,176

YALE AND TOWNE MANUFACTURING CO., Philadelphia, Pa.
Heavy trucks—18 ea.—$63,451

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have meant better, more
economical speedometer cable
FIRST to pioneer the use of flexible wire wound cable.
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FIRST to develop machines for precutting speedometer cable.
FIRST to introduce integral drive squares.
FIRST to develop satisfactory swaging equipment for speedometer cable.
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FIRST to introduce galvanized casings for speedometer service.

The small diameter, galvanized speedometer casing shown here is in universal use today. Light in weight, economical and attractive, it was introduced by S.S.White many years ago to replace the heavier, more expensive casings then in vogue. The accumulated savings both in pounds and dollars made possible by this development over the years can well be measured in the thousands.

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Ask for a copy of
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Interesting sidelights on the development and manufacture of speedometer cable are presented in this brochure. Write for a copy. Address Dept. A.

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FIRST NAME in flexible shafts for speedometer drives, industrial power drives and remote control.

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BOOKS . . .

1954 AIRCRAFT YEARBOOK, *published by Lincoln Press, 1143 National Press Bldg., Washington 4, D. C. Price, $6.00.* During 1954, aviation in the U. S. reached new high levels of achievement and importance, both in the civil and military fields. Aircraft production emphasis moved from the build-up phase of the national rearmament effort to a program in which improvements in quality of the product were accorded increased priority and attention. During the year, employment in aircraft manufacture passed the 800,000 mark and, as the year came to a close, was gradually declining, although the aircraft industry at year's end remained the nation's largest manufacturing employer. This 1954 edition, official publication of the Aircraft Industries Association, records in detail the achievements and problems of every major element of American aviation during the past year.

The *Problem Jobs* GO TO AETNA

Here's one of motordom's finest torque converters and its one-way, 20 sprag clutch unit—big reasons why today's automatic transmissions send engine power to the wheels in a single, uninterrupted stream of mounting energy—so smoothly, so quietly you can hardly tell when they shift.

Why, since we make only the outer and inner races of this one-way clutch unit, do we call it a problem job? You should see the complex "specs", the super-rigid standards these races must meet . . . in squareness, concentricity, parallelism, size and finish . . . in the selective hardening and grain structure of the steel. In all, 59 specifications to the set.

To uniformly maintain such a galaxy of high standards, the torque converter makers knew from the start they had a ticklish job calling for a top-flight supply source. In turning it over to Aetna what appealed to them was not only Aetna's matchless experience, skill and special interest in hard-to-make parts, but also Aetna's proven ingenuity in innovating processing and control methods to make them better, faster and most economically.

Our staff of engineers, metallurgists and designers can help you too—from the inception of your ideas or problems to the final answers and applications of special ball bearings, roller bearings and miscellaneous bearing-type parts. A note from you will bring prompt action.

Standard and Special Ball Thrust Bearings • Angular Contact Ball Bearings • Radial Ball Bearing Mounted Units • Special Roller Bearings • Ball Retainers • Hardened and Ground Washers • Sleeves • Bushings • Miscellaneous Parts

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FACTS ABOUT JOMACS

- Made from the famous loop-pile fabric identified with the Jomac name for 17 years
- Rugged protection for hands against hot, sharp, or abrasive objects—yet flexible for comfort and full finger freedom
- Many styles interchangeable—fit either hand—so each pair has four long-wearing surfaces
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Russian Engineers Inspect British Automobile Plants

(Continued from page 73)

are going into production. These include the Volga with automatic transmission to replace the Pobeda, and the smaller M20A and M72. Russia is anticipating greater exports of cars to the West, and feels that improved models will better its competitive position. Shipment of 10,000 cars to Finland is already scheduled, 2000 are going to Norway, and smaller numbers to other non-Communist countries.

Yet designs remain basically conventional, and no radical departures are anticipated. For example, air-cooled engines are not looked upon with favor, despite their wide acceptance in Czechoslovakia and East Germany. The futuristic NAMI-013 is purely an experimental project built by the Motor Industry Research Association to try out some new ideas. It includes such features as a rear-mounted engine, twin aircraft-type radiators up front, independent suspension on all wheels, power steering, and single pedal control (brake up, accelerator down). Mr. Kriger stated that it did not necessarily indicate thought trends among Russian designers.

He reported that the Soviets are now encouraging a greater exchange of technical information with the West. Many foreign publications are received and widely circulated, he said. At the same time, many more western visitors are now able to visit Soviet automobile factories. Four or five groups of them a day currently toured his ZIS plant, Mr. Kriger said, including recently a party of British S.M.M.T. officials, and another of U. S. Senators.

More visits could undoubtedly be arranged in the future, he thought, but added that he was only a designer and not a politician. During 1935 and 1936 Mr. Kriger spent considerable time in the Detroit area, and having just inspected a number of British factories he said he would be interested to go to America again to see how U. S. plants compared.

At the end of the interview Mr. Kriger was asked whether he would like to put any questions. After several moments' thought he replied: "When will the horsepower race in America end, and why hasn't the V-6 been adopted more widely?"

J&L cold drawn leaded steel bars work to your over-all cost advantage

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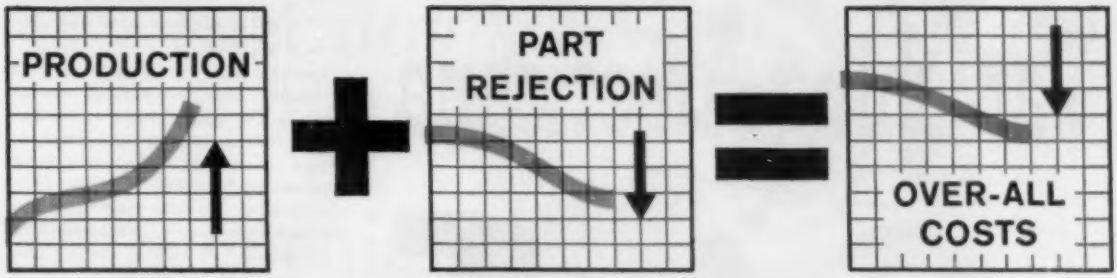

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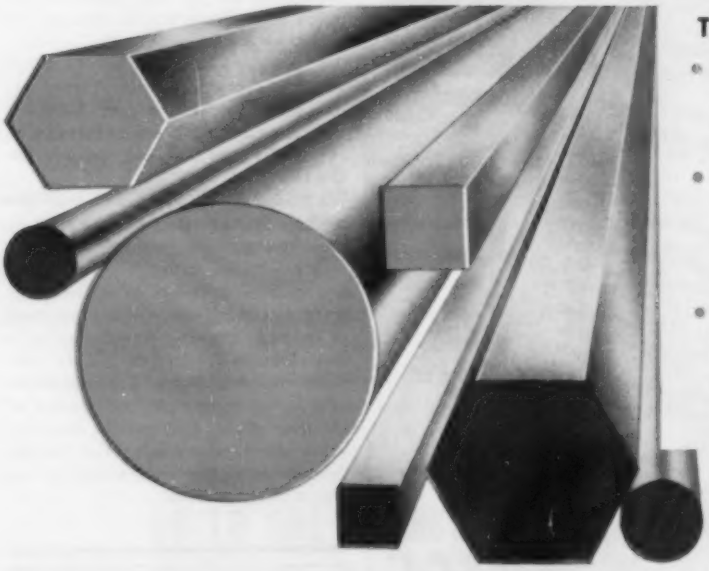

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New Defense Facilities

SUPPLEMENTING the list of Certificates of Necessity issued up to Oct. 19, authorizing new or expanded defense plant facilities for the manufacture of automotive and aviation war goods which was published in the Nov. 15 issue, page 201 of AUTOMOTIVE INDUSTRIES, the following additional certificates were announced by the Office of Defense Mobilization, covering the period which extends from Oct. 20 to Nov. 2, inclusive.

The figure appearing in parentheses is the percentage authorized in respect to actual fast tax write-offs.

AERONCA MANUFACTURING CORP., Middletown, Ohio
Aircraft parts—$32,426 (65)

BEECH AIRCRAFT CORP., Wichita & Herington, Kans.
Military aircraft parts—$154,865 (65)

KEARFOTT MANUFACTURING CORP., Newark, New Jersey
Aircraft instruments—$105,772 (65)

KEARFOTT COMPANY, INC., Black Mountain, North Carolina
Aircraft instruments—$171,615 (85)

McDONNELL AIRCRAFT CORP., St. Louis, Mo.
Military aircraft—$4,177,000 (60), $48,000 (100), $1,872,000 (60)

THE PARKER APPLIANCE CO., Berea, Kentucky
Aircraft parts—$26,901 (40), $115,436 (65)

UNITED AIRCRAFT CORP., Pratt & Whitney Aircraft Div., North Haven, Conn.
Military aircraft engines — $10,000,000 (60)

Vanishing Americana

Whoever first thought of sticking his arm out the car window to let other motorists know what he was about to do certainly had a good idea . . . so good, in fact, that very shortly every driver got into the act—each with his own personal set of signals—each as distinctive and confusing as the next.

Later, all 48 states issued their own standards of hand signalling. But variations by smokers, arm-danglers and a hard core of non-conformists continued to contribute a considerable amount of confusion.

Since 1939, however, hand signals have been on their way out. Hastening their demise was the development of the commanding and decisive flashing-light directional signal. The heart of this system is the Tung-Sol Flasher.

To date, Tung-Sol has made more than 50 million Signal Flashers which have built an amazing record for life-of-the-car dependability. Wherever you plan to use a signal light, make it a commanding light with a Tung-Sol Flasher.

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Sales Offices: Atlanta, Chicago, Columbus, Culver City, Dallas, Denver, Detroit, Newark, Philadelphia, Seattle. Canada: Montreal

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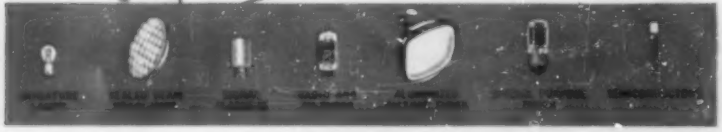

Bodies Assembled Before Painting at Chrysler Plant

(Continued from page 55)

Another point of interest is that as bodies leave the various drying ovens in the paint shops and enter cooling booths, they are subjected to a blast of cool air that lowers their temperature from 250 F to 125 F in two minutes. Besides making bodies comfortable to handle, this rapid drop in temperature is said to aid in "setting" the hard enamel finish.

The entire paint shop is windowless and sealed to prevent entry of dust and dirt. It is served by a fresh air ventilating system, having a capacity of 382,000 cfm, providing 10 changes of air per hour except at the south end where air is changed 20 times per hour.

Paint spray booths, on the other hand, are provided with filtered air circulation at the rate of 1,580,000 cfm, directed downward to force paint over-spray into the water cascade under the floor.

Finally, it may be noted that the bodies move through the paint shop on massive structural steel skids to which they are bolted securely. These skids are removed as bodies enter the hardware assembly lines and are returned to the body framing department on a long monorail conveyor. This conveyor returns across the bridge as seen in the lower right hand corner of the floor plan. Incidentally, the conveyor also carries small metal baskets into which the various fastenings are placed after removal.

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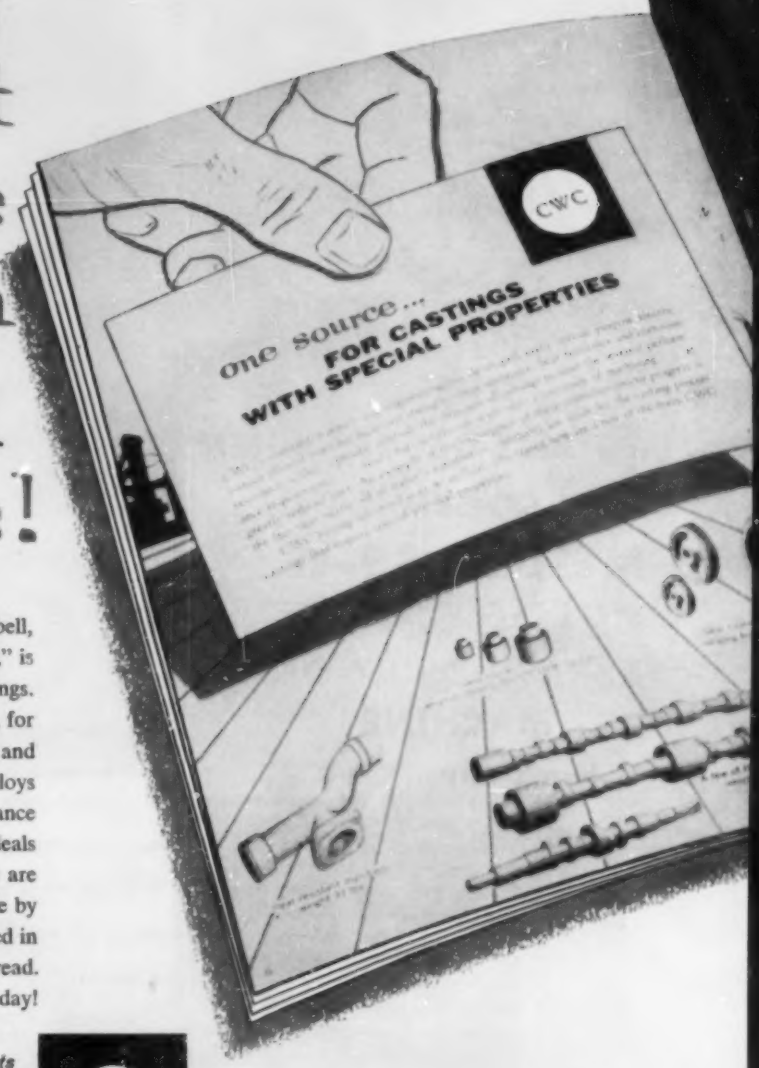
MANUFACTURING

Special reading about castings with special properties!



Now . . . the latest casting information! Campbell, Wyant and Cannon's new booklet, "One Source," is filled with interesting data on many types of castings. The section on castings with special properties, for example, tells how CWC's constant research and advanced engineering give life to new and better alloys that assure increased strength and greater resistance to wear, heat and corrosion. "One Source" also deals with the subjects listed below . . . and there are photographs of the broad range of castings made by CWC. It's a booklet that everyone interested in castings—either directly or indirectly—should read. Send for your free copy today!

Whatever Your Requirements

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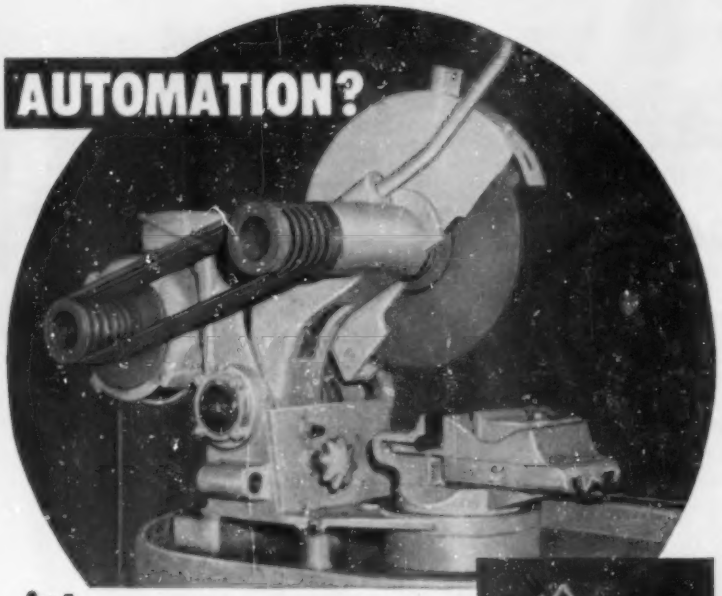

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- Vise operates by air cylinder . . . integrated head, vise operation is excellent safety feature.
- Feeding mechanism which grips material to be cut, moves it into position.
- A series of micro switches tie above operations into smooth cycle which repeats automatically.
- Stainless steel spindle with Grease Sealed bearings.
- Coolant applied equally to both sides of cut.
- Vise holds both ends of piece being cut.
- Abundant power supplied by 7½ H.P. motor.
- Swivel head for accurate angle cutting.
- Accurate counterbalance of head by location of motor.
- Heavyweight for long life and efficient operation.
- *Complete automation* produces close tolerances, increases production, saves labor.

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LOBDELL DIVISION

UNITED ENGINEERING AND FOUNDRY COMPANY

WILMINGTON 99, DELAWARE

Vibration Problems in Gas Turbine Engines

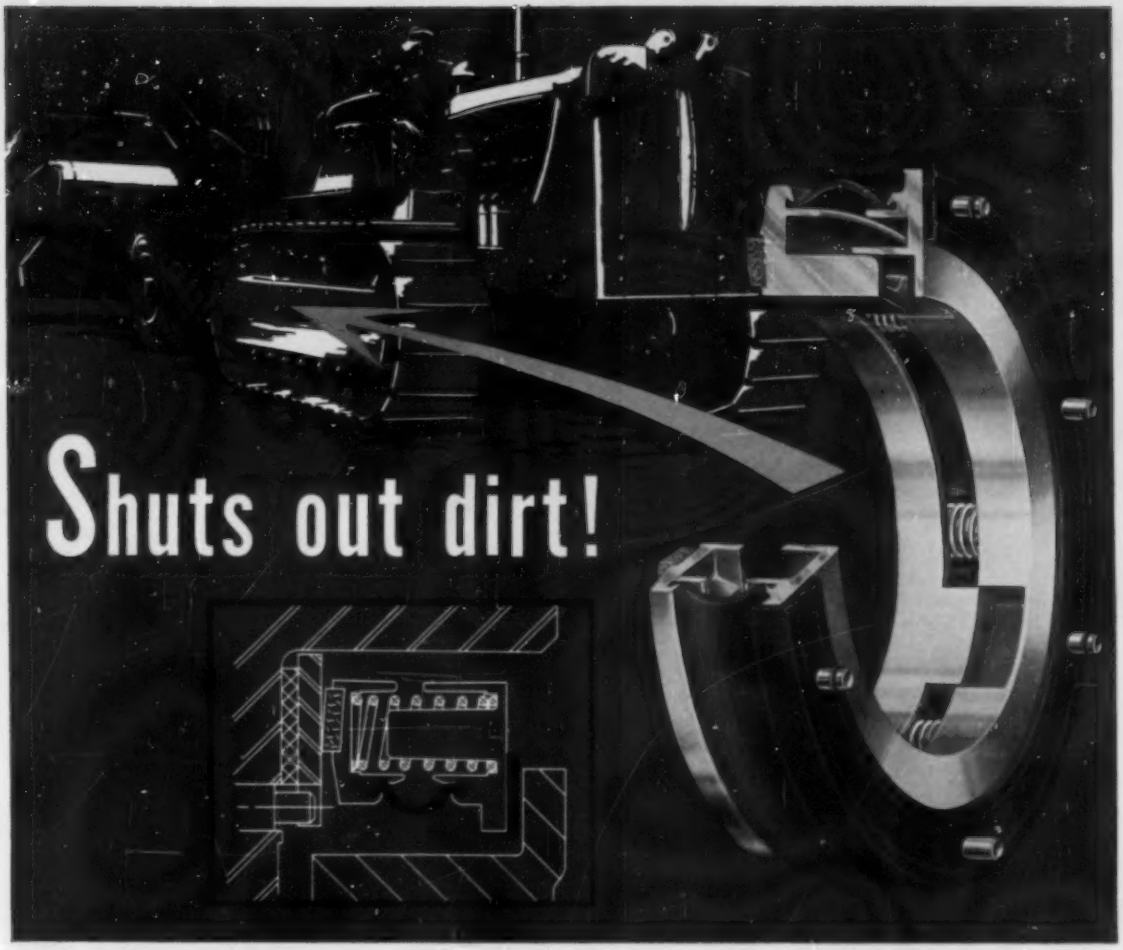
(Continued from page 94)

to 0.0002-in. runout of the inner ball race and another 0.0002-in. in the outer race. At 36,000 rpm this runout tolerance can cause a 600-c vibration of the engine structure of 14 g magnitude. Just how serious this is we do not yet know, and it should be understood that even with this vibration the engine by all previous standards is quite smooth. No shaking of the engine or supporting structure can be seen or felt by the observer. In fact, it is only recently that equipment to measure the small amplitudes of such high-frequency vibration has become available. We do know, however, that engines with vibrations in the neighborhood of 40 g amplitude suffer fatigue cracking failures of burner shells, burner liners, nozzle tie rods, spark plugs, heat shields, and other sheet metal parts. Thus, a vibration tolerance in the neighborhood of 10 to 20 g is indicated for production engine acceptability.

The above article is an abstract of a paper presented by the author at the Symposium on the Role of the Small Gas Turbine Engine. Held recently in New York City, the Symposium was under the auspices of the Polytechnic Institute of Brooklyn, the Metropolitan Section of the American Society of Mechanical Engineers, and the Metropolitan Section of the Society of Automotive Engineers.

BOOKS . . .

THE AMERICAN ECONOMY — ATTITUDES AND OPINIONS, *by A. Dudley Ward, published by Harper & Bros., 49 E. 33rd St., New York 16, N. Y. Price, $3.50.* This book, the sixth in the important Series on Ethics and Economic Life sponsored by the National Council of Churches, is designed to record and weigh the attitudes and opinions of certain groups of Americans concerning their own economic conditions and problems, and the ethical values involved. Based on intensive research through group and individual interviews, the study covers a wide range of age and income levels, occupations, and geographic areas. Extensive quotations from the interviews enliven the text of this revealing and valuable study. The findings show how these individuals and groups felt about their working conditions, the personal satisfactions and usefulness of their jobs, the adequacy of their income, their aspirations for the future. While an attitude of complacency appeared in many interviews and discussions, the study discloses also an underlying concern about the ethics of business life and the problems of conscience that arise in earning a living.



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Without effective seals, mud and dust would grind the life out of this D6 tractor's final drive—fast. But it's got life-saving C/R Type VD End Face Seals. They keep dirt and water out, seal transmission oil in under considerable end-play and at shaft speeds from 15 to 100 rpm. They're self-adjusting, self-aligning . . . never need take-up or attention. Proved by hundreds of thousands of field hours, these rugged C/R Oil Seals are giving longer service life to the D6 . . . saving big dollars in repairs. C/R's unequalled engineering and production facilities are at your service, too. Write for your copy of "C/R End Face Seals."

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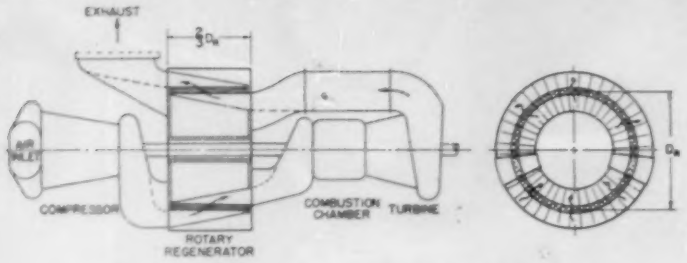
ASME Diamond Jubilee

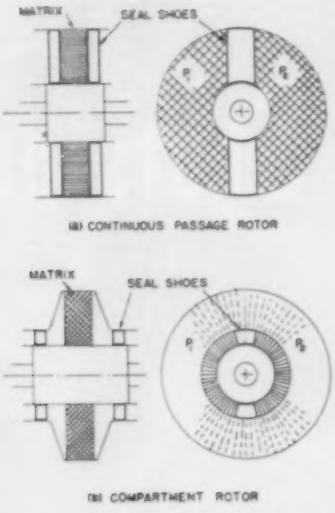
(*Continued from page 49*)

pressure generating combustion chambers, and envisioned a centrifugal blower driven by a number of fast rotating pulsejets. In the future, he said, the ideal heat engine may well have all changes of state take place at high speed of flow.

Rotary regenerator design, of great interest currently, requires study of seal leakage. A method of reducing leakage and conclusions about future regenerator design were made by D. B. Harper of Aluminum Co. of Canada, Ltd.



Rotary regenerator designs and plant layout (Harper)



Creative training is producing interesting results at AC Spark Plug, reported J. A. Anderson. Before-and-after tests of 39 automotive engineers showed a 41 per cent increase in the number of ideas produced. Those engineers with the lowest idea-producing record before training made the greatest percentage gains, Anderson said. He added that 25 to 50 per cent of engineers in general are very low in creative ability, according to other tests.

Scheduling production by means of computers was outlined by A. J. Rowe and J. R. Jackson of U. of California, Los Angeles. They discussed simulated experimentation as a valuable tool for research in this field. Basic concepts concerning material-handling costs were pointed out by B. W. Saunders of Cornell University, who said new ASME formulas should be devised for evaluating all costs to find

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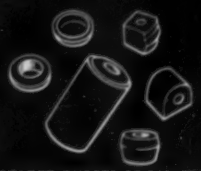
MONRO-MATIC SHOCK ABSORBERS— Standard equipment on more makes of cars than any other brand.



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There's hardly a power driven machine built that doesn't depend on gears for its get-up-and-go—its productivity—and very often *its reputation.*

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SPUR GEARS—Straight, helical, and internal. Sizes from 16 pitch, 1½" dia., to 1½ pitch, 36" dia.
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WORMS AND WORM GEARS—Worms to 7" dia. Worm gears to 36" dia.
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DIFFERENTIALS—10,000 to 300,000 inch pounds capacity.

Note: All sizes above are approximate.

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the lowest overall production cost. Flexible outdoor storage procedures in use by Timken Roller Bearing Co. were explained by F. C. Wier, and he pointed to specific means of lowering handling costs. Unit loading is a key point, Wier said, and this was seconded by R. B. Gesse of Caterpillar Tractor Co. Gesse covered an intensive program in handling that his firm carried out after WW II and showed its results in better movement and lower cost.

British Trades at Scottish Motor Show

(*Continued from page* 59)

poise chassis are powered by a six-cylinder gas engine developing 91 hp at 3100 rpm. Bores can be chromed at the buyer's option. An overdrive, flange-mounted behind the standard four-speed gearbox, is offered as extra equipment. This unit, with a ratio of 0.822 to 1, provides a fifth gear to make possible faster cruising, or lower engine revolutions and fuel consumption at a given speed. Consisting of constant mesh helical gears, the overdrive is engaged in the normal way by the selection lever, which is fitted with a release trigger to prevent accidental selection. A Perkins six-cylinder Diesel can be supplied as an alternate engine on all but the smallest trucks of this range.

Dropside and dump bodies are available on the large Commers. Improvements over earlier models include better visibility from the driver's seat, widening of the integral-welded cab to 60¼ in. at shoulder height, and a lower loading line for the drop-siders.

Albion, Scotland's only vehicle builder, appropriately unveiled its Nimbus at Kelvin Hall. This lightweight under-floor-engined bus is intended for low traffic density routes and feeder services with one-man operation. A novel feature of the 11 ft, 10 in. wheelbase chassis is the sloping position of the radiator, which is mounted between the main frame members just ahead of the front axle. Adequate ground clearance and a good convection area without raising the floor height are achieved by this layout. The radiator itself comprises two stacked cores connected in series, so that the water crosses its surface twice. Improved cooling under wide temperature variations is said to result. The shaft-driven fan is mounted in a prism-shaped cowling.

The horizontal engine is carried

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"Eliminates" Return-Stroke
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"Doubles" Length of Stroke

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COLONIAL
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DETROIT 13, MICH.

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centrally in the chassis. It is a four-cylinder 234 cu in. Diesel developing 60 hp at 2200 rpm. It is accessible through a hinged side panel, and maintenance is eased by the use of slip-fit dry cylinder liners, a centrifugal oil filter which does not require a replaceable element, renewable valve seat inserts, and a self-adjusting water pump. The oil bath air cleaner is just behind the front bumper, while extension pipes for fuel, oil and water are carried to one side of the body. Drive is through a four-speed gearbox to an overhead worm rear axle.

The 8-ft wide body of the Nimbus takes full advantage of the latest regulations. It seats 31 passengers and has a wide central gangway. Total unladen weight of the vehicle is 8700 lb.

A larger under-floor-engined chassis on Show was an improved version of the Daimler "Freeline" for single-deck buses. It incorporates power-assisted steering, brakes, gear engaging pedal, and automatic chassis lubrication. The operating system can be air or hydraulic, according to choice. Power from the 150 hp horizontal Diesel is carried through a fluid drive and five-speed epicyclic gearbox.

The trend towards forward control or cab-over-engine design in medium-weight trucks to increase payload area has been followed by Dennis with its new 3-ton chassis. A high seating position gives the driver extended downward and outward vision, while the cab is located well ahead of the front axle to give easy access. Engine is a 54 hp Perkins P.4V Diesel.

Of similar construction but considerably larger is the Seddon Mark 14, available as a tractor or two-axle truck with a gross vehicle weight of 19 tons. This is the maximum rating when powered by a 94 hp five-cylinder Gardner 5LW Diesel, but can be raised to 24 tons for the tractor with articulated trailer when the six-cylinder engine is used.

Another improved model in this category was the 8-ton Guy "Warrior," developed from the "Big Otter" prototype seen at Earls Court in London a year ago. Plastic fenders and front panels are a feature of the cab, which is located over the Meadows 85 hp Diesel. A variety of frame lengths and two-speed axle ratios is available.

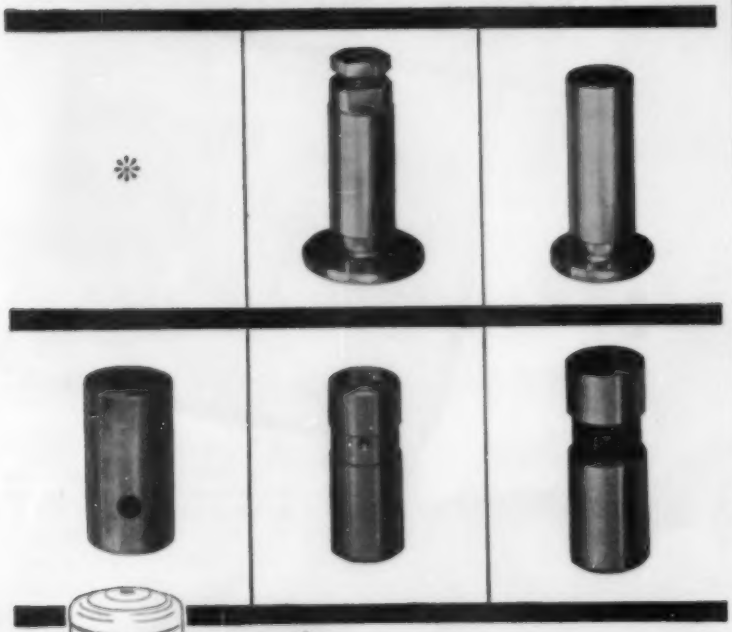
Thornycroft brought out its "Swiftsure" 6½-ton truck chassis, which is claimed to represent a big advance in design and performance over previous models in the medium load class. Of forward control construction, the glass reinforced plastic cab houses this company's newest high-speed Diesel. Designated as type JR6, it is of 255 cu in. displacement, and puts out 80 hp at 2600 rpm. The lubrication system is of some interest in that oil bypassed before the filter is piped directly back to the crankcase, thus providing maximum protection for the bearings while extending the life of the filter element. Another feature of the Swiftsure is a radiator cap duplicated inside the cab for inspection of water level.

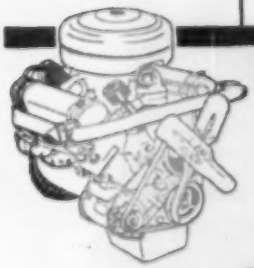
Typically British was Thornycroft's latest 8-wheel chassis with load limit increased in keeping with the current regulations, which allow up to 24 tons gross weight for a four-axle machine. It has tandem steering of forward pairs of wheels, and either one or both rear axles can be driven, according to the model desired.

The British Motor Corp. had on view its new 7-tonner built by Austin. This is powered by the B.M.C. 311.4 cu in. six-cylinder Diesel rated at 90 hp at 2400 rpm. The four-speed gearbox and electrically-operated two-

(*Turn to page 132, please*)

JOHNSON *tappets*





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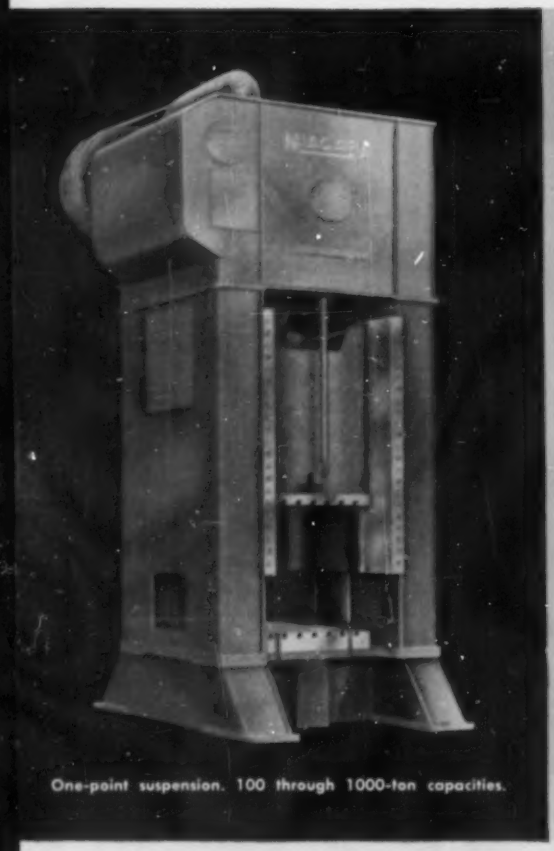

One-point suspension. 100 through 1000-ton capacities.

Four-point suspension. 200 through 1000-ton capacities.

ECCENTRIC DRIVE DELIVERS GREATER TORQUE WITH LESS DEFLECTION

In Niagara Series SE Presses, the eccentric is an integral part of the main gear (or gears) which rotates on a stationary pin rigidly supported in the crown, close to the point at which the pressure is exerted. Serving merely as a pivot, the pin carries no torsional load and relatively little bending load. Net result: Niagara's eccentric gear design can deliver greater torque with less deflection than other types of construction.

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Frames are rugged, all-steel, four-piece, tie-rod construction of great strength and rigidity, stress relieved in a furnace and thoroughly grit-blasted before machining. Each frame size has been scientifically tested for deflection to meet Niagara standards — the most exacting in the industry.

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Most of the weight of the Niagara clutch continues to rotate with the flywheel. Only the drive shaft and driving plate start and stop with each cycle. The resulting low weight and inertia of the parts, picked up during clutch engagement, greatly reduce heat and wear. As the clutch rotates, it acts as a centrifugal blower, providing positive ventilation. Plates automatically compensate for normal wear, with no adjustment necessary.

MODERN, STREAMLINED DESIGN EMPHASIZES COMPACTNESS

The entire driving assembly is neatly housed in the crown. There is no exposed, overhanging flywheel, clutch, brake, shaft nor motor in the rear of the press to obstruct crane service, block light, throw grease or consume space unnecessarily.

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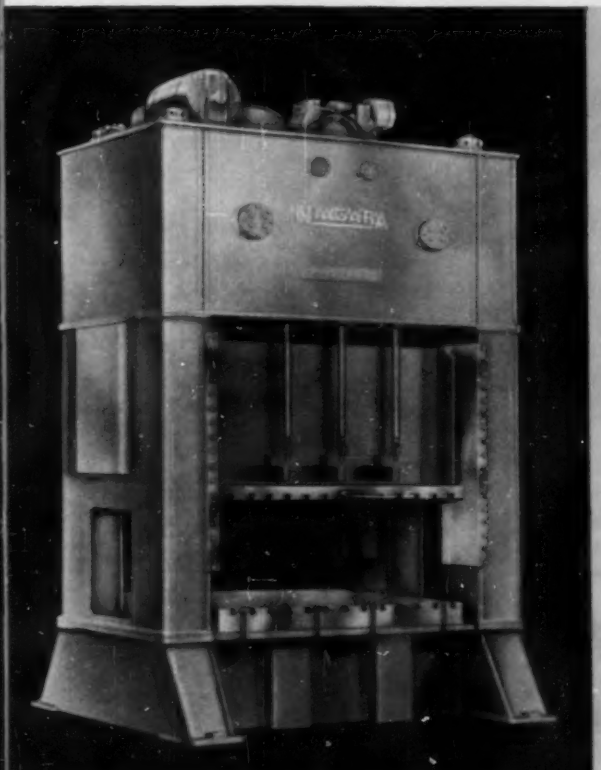

Two-point suspension. 200 through 1000-ton capacities.

Without equal in engineering design, performance and stamina, this great new line of Niagara Straight Side Eccentric Geared Presses is every inch a champion. It is an outstanding example of the advanced thinking that has made Niagara the pace-setter among builders of metal working machines for 75 years.

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Compactly and conveniently arranged on a master panel, Niagara controls are instantly accessible for fingertip direction of every press operation: starting, slide adjusting, jogging, die tryouts, running and stopping. The latest safety devices provide maximum protection for die setter, operator and the press itself. Nothing has been overlooked. Trial runs assure that all controls are in proper working order before each Niagara press leaves the plant.

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ECCENTRIC GEARED
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The CHICAGO SCREW COMPANY
2801 WASHINGTON BLVD.
BELLWOOD, ILLINOIS
Established 1872

(*Continued from page* 128)

speed Eaton axle provide a total of eight forward ratios. Hydraulic power-assisted steering is standard equipment. Cab-over-engine is used.

Rover has concentrated increasingly on the production of four-wheel-drive Land Rovers, and the most recent version to appear is the 10-passenger station wagon on the 107-in. wheelbase, which was on show at Glasgow. Folding seats, hinged to the body side members, are reached either through the separate rear doors, or the wide loading door at the back. A seven-passenger, two-door model with shorter body is built on the 86-in. chassis.

SAE Meeting

(*Continued from page* 57)

Latest details of the oil test engine of the Coordinating Research Council were presented by W. G. Ainsley of Sinclair Research Laboratories and A. E. Cleveland of Ford Motor Co. Test engines have completed endurance tests of 500 hours and operating difficulties have been held to a minimum.

Special Assembly Techniques

(*Continued from page* 70)

delivered to the assembly floor and are stored on the usual body storage lines for scheduling to assembly. Consequently, these bodies require somewhat more handling than do the Rambler bodies which come directly from storage in the Kenosha body plant. Another noteworthy difference is that Nash and Hudson bodies are delivered complete with deck lid but without front fenders and the latter are attached on the assembly line.

It will be obvious to any one who has followed the course of assembly techniques at Kenosha that the new final lines represent an important evolutionary advance, greatly simplifying assembly operations. The end result is faster and smoother flow with less effort on the part of the operators.

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The split-second deceleration of a panic stop exerts many thousand foot pounds of pressure against protective seat belts. A belt failure under such conditions would mean serious injury—even sudden death to the car's passengers.

Vital to the belt's holding qualities is its anchorage to the car frame, for which purpose leading manufacturers employ a wire cable assembly.

Anticipating greater highway speeds and industry needs for *unique* and *absolutely* reliable cable assemblies, Bergen Wire Rope Company research engineers concentrated their extensive experience on this problem successfully developing new designs and advanced production techniques to meet volume requirements.

The ruggedness and maximum strength of these cable assemblies is assured by rigid metallurgical tests for quality, uniformity and other *critical* factors . . special terminal fittings offer extra safety factors due to Bergen's *rotary swaging* which reduces metal fatigue and *always* insures perfect alignment.

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SERVING THE LEADERS OF INDUSTRY

AIRBRIEFS

(*Continued from page 98*)

A unique feature of this machine is its two-speed transmission which provides for a 500 rpm rotor speed in vertical flight and a 250 rpm rotor (as propeller) speed in forward flight. Transition is accomplished by rotating the plane of the rotors from the horizontal (shaft vertical) to vertical with the shaft horizontal. As the transition is made, the cyclic longitudinal and lateral rotor control locks out and the rotor speed automatically changes.

Endurance tests of the engine drive and rotors have been completed. Presently tests are being made, on a special platform, of the rotor tilting. It is expected to obtain an 80 per cent efficiency from the rotors acting as propellers when tilted 90 deg forward. Contractors' tests are to be completed in summer of 1956. Then Air Force flight tests will begin.

Transcendental Aircraft Company's Model 1-G is another tilting rotor type similar to the Bell XV-3. First privately developed some years ago by Guerreri of New Castle, Del., with assistance of Robert Lichten (now with Bell Aircraft), this machine has been subjected to a series of ground and flight tests sponsored by the Air Force. Under the guidance of William Cobey, Transcendental's president, tests were made of the vibration characteristics and control response of the two-rotor machine.

Further tests were made of the mechanical instability of the machine with rotors tilted at various angles from shafts vertical to shafts horizontal. These were followed by flight tests. After making vertical flights and horizontal flights up to 70 per cent rotor unloading, the machine met with an unfortunate accident which damaged it considerably but did not injure the test pilot.

Progress on the retractable rotor type Convertiplane was noted by design studies and wind tunnel tests made on Sikorskys' single blade, retractable rotor system. Here the counterbalanced blade is jet driven at the blade tip for vertical flight. As forward speed is attained the machine designed proposes to stop the rotor and retract it into the top of the fuselage, then proceed to high forward speed flight with conventional propeller for thrust and a small wing for lift.

Wind tunnel tests on a model of this configuration indicated the design was feasible but more tests should be conducted before proceeding with flight test vehicle. Present plans call for additional wind tunnel tests on a single blade model sponsored by the Air Force. Sikorsky Aircraft Division of United Aircraft Corp. is also investigating a two bladed retractable rotor system and plan to test this in their own wind tunnel.

Another retractable rotor system is being developed by Hiller Helicopters, Inc., of Palo Alto, Calif., under contract with the Air Force. The rotor, a two bladed tetering type like the Hiller YH-32 is shaft, instead of jet, driven. Each blade has hinges at 1/3 radius for folding and assist in retracting the rotor. When completed the unit will be tested on the whirl tower at Wright Field for structural reliability and functional operation.

Colonel Zinns commented that the Air Force will carefully evaluate these developments along with projects sponsored by the Navy to determine the direction to go with this hybrid type of aircraft. His discussion was followed by a motion picture film

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Outstanding motor quality and uniformity are the result of our high degree of specialization in both equipment and methods, combined with rigid process control.

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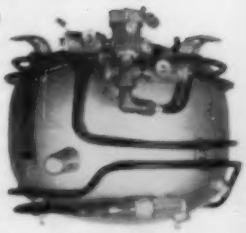

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ARO "Anti-G" Valves — afford protection to Super Sabre pilots against the physical strain of extreme centrifugal force.

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showing flights and tests of the McDonnel XV-3 and the Bell XV-1 convertiplanes.

Report from the Navy

Commander C. R. Horton, of the Anti-Submarines Systems Branch, U. S. Navy, spoke on the requirements of the Navy which might be met by the convertible type of aircraft. It would seem that the convertiplane has the potential to increase the defensive and offensive ability of the fleet. Although the helicopter is now serving as a useful type it has limitations because of its relatively slow speed, short range of flight and small payload.

Two approaches are being taken by the Navy to investigate the potential of the convertiplane. One is to develop a very high speed aircraft with slower and slower landing speeds, like the development of the VTOL (vertical take-off and landing) as represented by Convair Aircraft Company's VTO, the flying Pogo Stick. The other approach is to improve the helicopter to obtain higher and higher speeds, like the convertiplane type, which for Navy use must be able to hover for long periods of

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Bendix-Scinflex* socket contacts have always been machined from bar stock. Stampings, with their required thin sections, can be easily overstressed..

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The "Clip-Type" socket will not accept any oversize probe or pin, nor can one be forced into it. Also, no amount of wrenching or twisting of an acceptable pin or probe can possibly distort the spring clip. This new socket is now standard in all Scinflex connectors including those using solderless, high-temperature and thermocouple contacts.

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*TRADE-MARK

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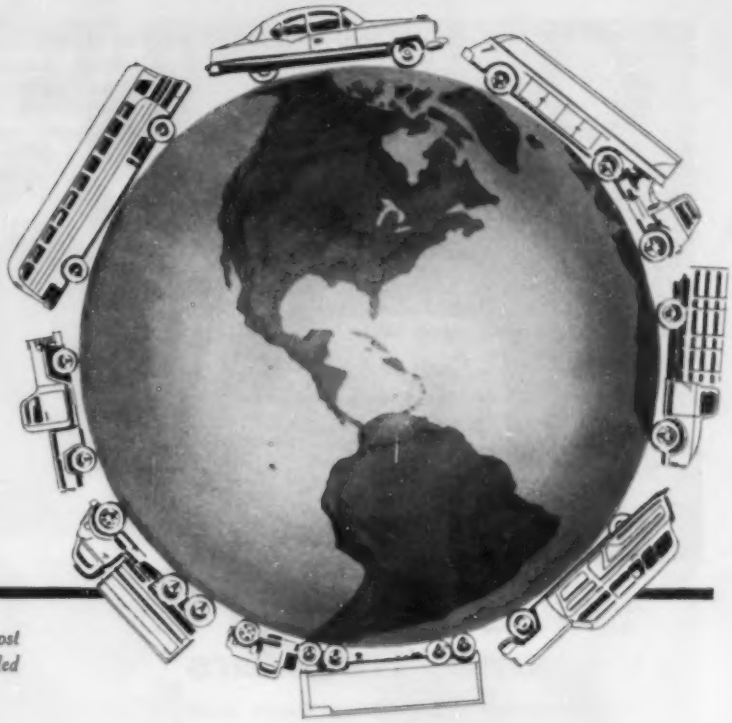

*22,000,000 times around the world or almost 1000 times farther than the earth traveled around the sun.**

***During 1954, passenger cars, trucks and buses—all served by stainless steel in either operating parts, structural members or decorative trim—piled up an incredible 550,000,000,000 miles.**

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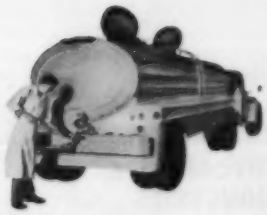

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time and get somewhere fast and in a hurry.

VTO's are considered for protection of convoys and groups of small ships as well as for close air support of beachhead landings. Convertiplanes might improve rescue use by saving time—getting there faster—for amphibious assault and ship to shore flights.

Commander Horton noted that the Navy has requirements which the convertiplane might meet but at the present time there is no definite mission now established for it.

Report from the Army

Colonel John Rowan, Aircraft Dept., Hqrs. G-3, U.S.A., commented upon the Army's requirements for convertible aircraft. For assault landings they want high speed capabilities combined with slow speed landing. Presently they are concerned with helicopters which carry a 1½-ton, a three-ton and a five-ton cargo load. (Reference here probably included the Piasecki H-21 and YH-16 helicopters.) They are also sponsoring the development of the Bell XV-3 convertiplane and other projects.

The Army's requirement for airlift to area of operations is furnished by the Air Force. Aircraft for observation, rescue and supply support of ground operations are a part of the Army's Transportation Corps. It is essential that they have some kind of operations base to service, supply and maintain aircraft. Therefore, their ideal type might not necessarily be fully a convertiplane. Space would be available to permit some forward speed for take-off and landing.

Colonel Rowan stated that the Army has a definite requirement for the convertiplane if it will meet their specification for low maintenance costs and reduced training requirements.

Comments by Brig. Gen. Ira Snyder, Tactical Air Command, USAF: Great requirement of TAC is "Mobility of Force," get men and material to where and when needed. A movement of support element is of first consideration. The need for vertical landing aircraft becomes critical as you approach the immediate area of field operations. Here is where the "pea patch" aircraft is of most value. The area in front of enemy lines must be dispersed; vertical landing aircraft and aircraft which can hover are of real value in supply, personnel and communication use.

Discussion

During the discussion the following items of interest were noted. One individual inventor spoke of his difficulty in getting ideas accepted by the military services. He believed they should establish a procedure to encourage individuals by assisting their developments sufficiently for adequate technical evaluation and not deal exclusively with established aircraft companies for research and development of new ideas.

In answer to a question about when could a 10,000-lb payload convertiplane be ready for operational use, Col. Zinns expressed a personal opinion that it would require six to seven years. General Snyder suggested a 16,000-lb payload for convertiplanes. Looking ahead to the development of lighter equipment, perhaps a 10,000-lb payload machine would be practical.

FASCO

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- HEADLAMP SWITCH

Time was, when Fasco automotive components such as these were considered only as "extras." But they served their purpose so well and contributed so much to over-all performance and customer satisfaction—that one by one, they have been adopted as standard equipment by America's leading manufacturers of cars and trucks . . . a fine tribute to Fasco engineering skill and product dependability.

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FASCO SERIES "400" PRESSURE SWITCH
FASCO HYDRAULIC STOPLIGHT SWITCH
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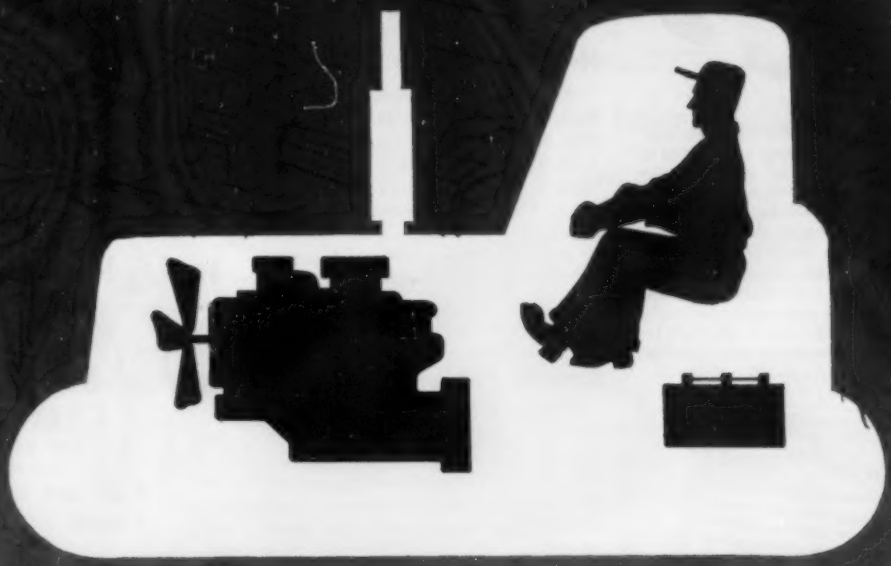

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Vehicles which will operate dependably in way-below-zero temperatures are being demanded more and more by government services. Engines and batteries must meet the test of 65°-below-zero starting and operation. Cabs must amply protect vehicle drivers, windshields and windows must defrost completely.

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L-4

News of the MACHINERY INDUSTRIES

(*Continued from page 87*)

monthly average was approximately $47 million. The Association feels that the peak for October was achieved by the Machine Tool Show, since some companies had delayed their purchases prior to the exhibition.

Hoe to Expand

With the recent announcement of its new Contract Manufacturing Division, the R. Hoe & Co., Inc., New York, maker of printing presses, will expand its activities in special machine design, engineering and other precision production. The company is planning to purchase $1.2 million worth of machine tools to completely modernize its shops, according to Hoe's president, J. L. Arner.

Around the Industry

Warner & Swasey recently celebrated its 75th Anniversary with an open house. Management reported that sales increased more than a hundredfold during the years — from $349,000 the first year the doors opened to nearly $40 million this year. President Walter K. Bailey told the group that the full production schedule enjoyed during the final quarter of this year should at least continue through the first half of 1956.

Bullard's nine-month statement shows almost a $22 million backlog.

Norton Co. has gathered some very interesting material on ceramic cutting tools using Norton Alundum. Tool bits are still in the experimental stage but are available to industry for machining studies. To show the capabilities of ceramic tooling, a table is provided herewith.

Snyder Tool and Engineering Co. and its subsidiary Arthur Colton Co. show a net income of almost $600,000 for the fiscal year ending June '55. Sales during the period were slightly over $9 million.

Cincinnati Milling Machine's president Frederick V. Geier says that shipments from "The Mill" should be around the $95 million mark for this year. Current backlog is approximately $70 million plus.

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the POWER you need in 1/3 less space...

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- *air and hydraulic*
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O-M's special interlocking mechanism strips unnecessary bulk, does away with tie rods and out-sized end caps . . . saves up to ⅓ the installation space required by conventional-type cylinders of the same bore.

This internal locking feature means less maintenance, too. O-M cylinders are easier to clean, inspect, remove, disassemble and service, with no alignment problems in re-assembly.

Available in complete range of sizes (1½ to 8" bores), with standard, 2 to 1 or oversize rods. All steel construction with bearing bronze. Completely interchangeable parts. Immediate delivery on many sizes.

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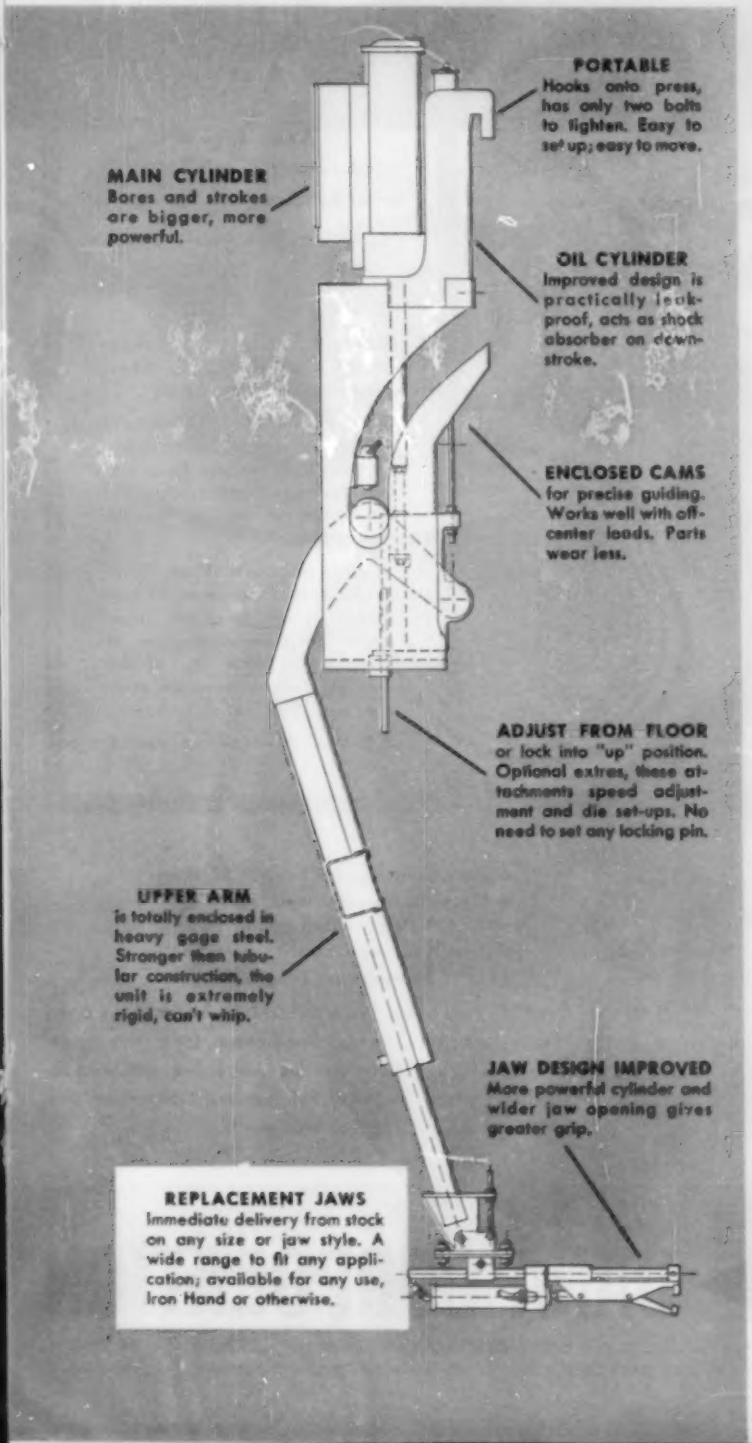
New 1955 Model Iron Hand is more rugged than ever


PORTABLE
Hooks onto press, has only two bolts to tighten. Easy to set up; easy to move.
MAIN CYLINDER
Bores and strokes are bigger, more powerful.
OIL CYLINDER
Improved design is practically leak-proof, acts as shock absorber on down-stroke.
ENCLOSED CAMS
for precise guiding. Works well with off-center loads. Parts wear less.
ADJUST FROM FLOOR
or lock into "up" position. Optional extras, these attachments speed adjustment and die set-ups. No need to set any locking pin.
UPPER ARM
is totally enclosed in heavy gage steel. Stronger than tubular construction, the unit is extremely rigid, can't whip.
JAW DESIGN IMPROVED
More powerful cylinder and wider jaw opening gives greater grip.
REPLACEMENT JAWS
Immediate delivery from stock on any size or jaw style. A wide range to fit any application; available for any use, Iron Hand or otherwise.

Redesigned for heavy-duty work, it takes today's tough jobs with ease

The new 1955 Model Iron Hand has been designed from the ground up for bruising daily double-shift operation: jaws are wider-opening and much stronger, cams more precise, and the frame more rigid. The new design makes it easier to install, easier to adjust, and a cinch to move from press to press.

And performance reports from the field prove that maintenance time—always negligible—has been slashed to the bone by the new design.

Whether you now operate a battery of Iron Hands, or are first considering them, you ought to study the design improvements in the new 1955 Models. For complete information, write

SAHLIN
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OVERHEAD ARMS • FLOOR TYPE UNLOADERS
TURNOVER, TRANSFER AND LOADING MACHINERY

IRON HAND

Easy Effortless Shifting...

WITH THE NEW Spicer

Advantages of Air-Assist Control with Spicer Synchronized Transmission

1. No change in shifting pattern. Operator goes through motions—air does the work . . . quickly, easily, quietly.
2. In case of air loss, transmission can be shifted manually, going through the regular gear shift pattern.
3. Permits more latitude in design of shift lever to avoid cab interference. The long lever required for proper hand leverage to shift synchronized transmission not required when Air Assist is used.
4. Easily adaptable to any Spicer Synchronized Transmission, as substitution of shift tower only is required. Air Assist cylinder can be assembled at either side of shift lever and air hose connection available at both ends of air cylinder.
5. Only one outside air hose required.

The new Spicer AIR-ASSIST Shift is another Dana Corporation development to make truck and bus operation easier, smoother, safer!

The AIR-ASSIST Shift is available only on Spicer Synchronized Transmissions . . . optional on new equipment, or available as a replacement unit on Spicer Synchronized Transmissions now in use.

The AIR-ASSIST Shift adds another feature to the long list of advantages already offered by the Spicer Synchronized Transmission:

- **Equal Shifts for Driver Convenience**
- **Positive Blocker Type Synchronizers**
- **More Leverage for Ease in Shifting**
- **Alloy Steel Carburized Gears**
- **TOCCO Fork Pads for Long Wear**
- **Gear Hopping Guards**
- **Large Bearings for Long Mileage**

Over 250,000 Spicer Synchronized Transmissions have been installed in heavy-duty trucks and busses, for a wide range of civilian and military services. Ask Spicer engineers to help you adapt the Spicer Synchronized Transmission and the new AIR-ASSIST Shift to your needs.

Spicer

DANA CORPORATION

AIR ASSIST SHIFT

An exclusive feature of the Spicer Synchronized Transmission

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SPICER PRODUCTS: TRANSMISSIONS • UNIVERSAL JOINTS • PROPELLER SHAFTS • AXLES • TORQUE CONVERTERS • GEAR BOXES • POWER TAKE-OFFS • POWER TAKE-OFF JOINTS • RAIL CAR DRIVES • RAILWAY GENERATOR DRIVES • STAMPINGS • SPICER and AUBURN CLUTCHES • PARISH FRAMES

The BUSINESS PULSE

(*Continued from page* 106)

been good reason to suspect that resources were being utilized almost to capacity—and that hence the possibility of inflation was present—but owing to the uncertainty which followed the President's illness, it was impossible to be sure that the situation would continue, particularly in view of the faltering of security markets. By mid-November, however, doubts on this score were pretty largely dispelled.

There were additional developments during the period which were probably of even more importance in indicating to Reserve officials the desirability of restraint.

Expansion Plans

First, corporations unveiled a number of ambitious expansion plans. A number of steel companies, for example, disclosed that they intend to embark on large investment projects beginning next year. Railroad companies similarly announced intentions to add substantially to their rolling stock. The Standard Oil Company of New Jersey outlined a projected rise in capital spending for 1956 of some 20 per cent, the Chrysler Corp. revealed that it was contemplating investment of more than $1 billion over the next five years, and so on.

Second, the Government released a very optimistic estimate for new construction expenditures next year. This estimate, prepared jointly by the Commerce and Labor Departments, puts total construction outlay next year at a phenomenal $44 billion, five per cent above the $42 billion record indicated for 1955.

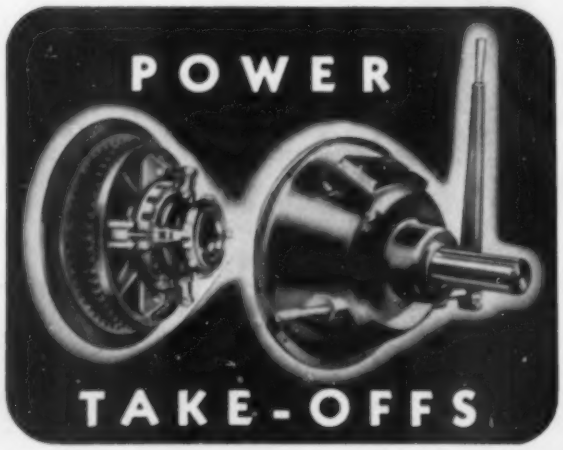
Thus, Federal Reserve officials were presented with important reasons between mid-October and mid-November for expecting that pressure on resources would mount.

Significance of Rediscount Rate

Besides indicating that the Federal Reserve was still concerned with the possibility of inflation, the increase in the rediscount rate was significant for another reason, which is even more important from the long-range standpoint. It showed that the present makers of Federal Reserve policy will not be deterred from taking unpopular action whenever they regard such action as necessary in the interest of a sound credit and money situation. This demonstration of a willingness to pursue policies that are bound to encounter disapproval should dispel some notions regarding Federal Reserve policy which have been in vogue of late. Before the latest increase in the rediscount rate, for example, one frequently read statements to the effect that monetary policy would shortly be eased because "next year is an election year."

The credence apparently given to predictions of this sort was surprising, because the record does not justify it. Since the famous "full accord" of 1951 the Reserve System has pursued flexible policies, which appear to have been based solely on its evaluation of credit conditions and requirements. No subservience to the Administration has been evident. The latest rate increase underscores this independence and discredits the view that the Reserve System will be responsive to political dictates.

ROCKFORD



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* ROCKFORD POWER TAKE-OFFS are equipped with roller bearings of ample proportions to carry the loads to be placed upon them. Provision is made for adjusting the tapered roller bearings that support the shaft. These and the clutch release bearing can be lubricated from outside the housing.

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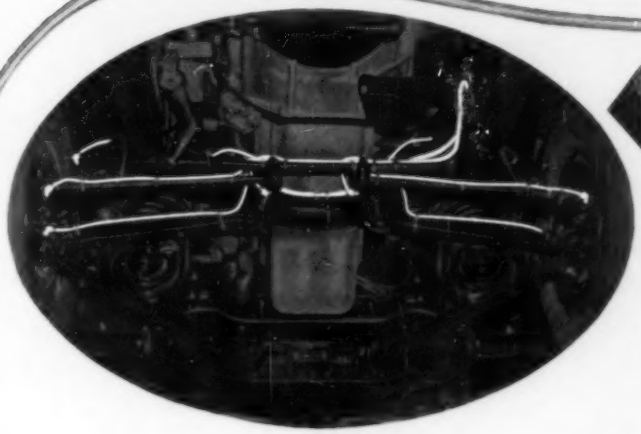
NOW! nylaflow* lubricant lines outperform other tubing... yet often cost less!



IT'S NYLAFLOW* FOR THE LUBRICANT LINES in the new push-button power lubrication system for 1955 Lincoln and Mercury automobiles. Lincoln Engineering Co. of St. Louis chose NYLAFLOW tubing because it is dent proof and flexes as chassis members move. NYLAFLOW also costs less than other tubing tested, and is faster, cheaper and easier to assemble and install.

nylaflow* . . . the new flexible nylon tubing . . . is truly the modern flow line for lubrication systems. And here's why.

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It's chemically resistant to lubricants and any additives, inhibitors, etc., they may contain.

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Because it stands up against constant rubbing and flexing, NYLAFLOW tubing solves problems of vibration and moving surfaces or connections. Another thing, NYLAFLOW is resilient to resist accidental blows.

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Flexible NYLAFLOW tubing eliminates pre-bending. What's more, it can be run in continuous lengths with the result that only two end connections are required—either standard metal compression or flare fittings.

NYLAFLOW'S MADE FOR COST SAVINGS

With all its superior performance, NYLAFLOW costs less than copper tubing (in some small sizes) or flexible hose of comparable bursting strength. NYLAFLOW tubing is supplied in stock diameters and lengths, and in two grades: Type T with a tested bursting strength of 1,000 psi and Type H, 2,500 psi. Sizes in production at this time range from ⅛" O.D. to ⅜" O.D.

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. . . nylon . . . Teflon . . . and other non-metallic shapes

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A letter of interest to Every Press User!

Dear Sir:

During the last year our company has developed a new press of revolutionary design.

We have conducted a series of tests on this machine which has been witnessed by a large group of press experts.

The net impression of these people seems to indicate that our development may preface sweeping changes in the whole field of metal stamping.

It was our original intention to restrict the application of this press to certain specialized industrial fields, but it is now apparent that it has the broadest possible application and the pressure to release general information regarding its performance has been overwhelming.

We, therefore, use this open letter as an invitation to authorized personnel to see this machine in operation.

If you will express your desire in letter form on company stationery, it will receive our prompt attention.

Very truly yours,

WEAN EQUIPMENT CORPORATION

R. J. Wean, Jr.

R. J. Wean, Jr.
President

Wean

FLYING PRESS

Designed primarily for speed of operation, the Wean Flying Press is the first machine of its kind to successfully combine the fast operating advantages of continuously fed strip with dies which move with the strip.

The press differs greatly from conventional machines. Machine tool-like in appearance, it has a minimum of vibration and requires no foundation. In addition to its great speed, it incorporates several new design principles that should interest every press user.

An automatic adjustment of feed length while press is in motion, and the absence of a clutch and brake (the most frequent points of maintenance on conventional presses), are two examples of this advanced engineering.

Wean 60-ton Flying Press stamping out automotive hinge plates at 600 pieces-per-minute, using the same die set which on a conventional press made the parts at a rate of but 90 pieces-per-minute.

Wean EQUIPMENT CORPORATION Cleveland, Ohio

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United Air Lines' great fleet is made up of a variety of planes, ranging from giant 4-engine Cargoliners to fast DC-7s which provide the nation's largest high-speed cargo lift. So no matter what you ship, or where, United can offer you air freight service tailored to meet your particular needs.

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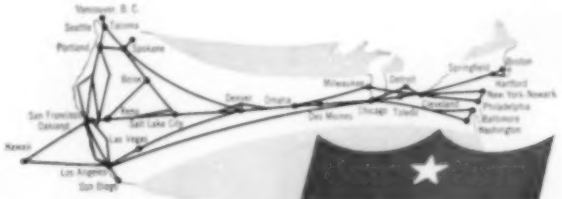

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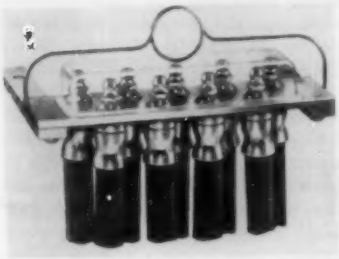
UNITED AIR LINES

NEW ACCESSORIES

Grease System

Central greasing installation for Ford and Chevrolet passenger cars is designed to permit greasing eight points from under the hood, without



lifting the car. High-pressure flexible hose is connected to each grease point and to a central header block. Dirt is said to be more easily excluded and servicing time reduced. *Forster Brothers Mfg. Co., 92 E. Lanark Ave., Lanark, Ill.*

Brake Lock

Auto-Safe, Rocky Ridge, Md., is importing a key operated hydraulic lock which is installed at the outlet end of the brake master cylinder. Two hydraulic lines run to the lock itself, which is mounted on the instrument panel where convenient. To lock the car, the operator turns the key and then steps on the brake once. Brakes remain set until the key unlocks them.

Pump Filter

A curb pump filter for removing abrasive solids from Diesel fuel and gasoline pumped from storage tanks to vehicles has been developed by *Purolator Products, Inc., Rahway, N. J.* The new filter, designated the PAG-25D dual fuel filter, consists of a cast iron head and duplex aluminum cases containing two resin impregnated micronic fuel filters. The large filtration

(Turn to page 150, please)

HI-EFF TAYLOR DRILLING MACHINES

NEW SERIES "C" MODEL 64

Like its companion models in Series A and Series B, this new, low cost Series C, "Model 64," is designed for sensitive, precision drilling on a production basis. Variable spindle speeds from 800 rpm to 10,000 rpm. Drills holes from .001" to .125" diameters. Compactly designed for maximum operator efficiency.

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International Division—Dumnano World Trade Co., Milwaukee 6, Wis., U. S. A.

HAVE YOU HEARD ABOUT THIS EXTRAORDINARY CLEANER?

It saves money in paint shops!

Oakite Rustripper is an alkaline material that strips paint, pigment residues and phosphate coatings from steel at the same time that it removes rust and oil.

It saves money in plating shops!

Oakite Rustripper removes rust or heat scale from steel at the same time that it removes oil and other soils. It avoids hydrogen embrittlement, damage to machined surfaces and other disadvantages of acid pickling.

FREE

For more information about how Oakite Rustripper eliminates operations in paint shops and plating shops, send for one or both of the illustrated booklets listed in the coupon.

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New Accessories

(Continued from page 149)

area results in a flow rate of 25 gpm for Diesel fuel and negligible pressure drop, while efficiently filtering particles 15-20 microns in size and larger. While this filter is primarily designed for efficient solids removal, the vertically mounted resin-impregnated elements will also remove a high percentage of free water from the product.

Fuel Vent System

Gasoline explosions can be almost entirely prevented on automotive vehicles, boats and fuel tank installations generally, according to inventor *Theron D. Whidden, Sr., c/o Dowd, Redfield & Johnstone, 501 Madison Ave., New York 22, N. Y.* The Whidden safety vent system is said to foil explosions by preventing air from entering a gasoline fuel tank or collecting around the filling pipes. The device gives the appearance of two small cans with inter-connecting tubes. There are no moving parts. Small amounts of mercury and glycerine are the heart of the system. The fuel intake vent on the vehicle tank is connected with the engine exhaust pipe. Carbon dioxide fumes from the exhaust pipe fill the void caused by the withdrawn fuel. These fumes are filtered through the mercury, then through the glycerine into the main tank. Carbon dioxide being heavier than air will remain in the tank when the filling cap is opened. As the inert gas is pushed out by the gasoline pouring into the tank it forms a protective cloud around the nozzle so that any fire or sparks in the vicinity will be promptly extinguished and not reach the open fill cap or gasoline entering the tank.

In addition to the safety feature of his system, the inventor says a significant fuel saving has been demonstrated on trucks bearing the device. This is accomplished by an expansion chamber which is part of the device. The chamber receives any spillage while the inert gases in the fuel tank tend to prevent evaporation.

Two Heaters

Arvin Industries, Inc., Columbus, Ind., will introduce two new hot water heaters for use with leading makers of passenger cars and trucks. The series 55 fresh air or recirculating

Steel body using Yoloy "E" for it's greater strength. This truck was developed for carrying large advertising signs.

Here's a high-strength low-alloy steel that's *easy to fabricate*

All Hi-strength steel unit for beverage deliveries.

Truck made entirely of Yoloy "E". This is a pallet type with sliding steel doors, mounted on standard chassis.

IT'S Yoloy "E", one of the Youngstown family of low-carbon, nickel-chrome-copper steels that are easy to fabricate, easy to weld.

Specialty Engineering Co. of Philadelphia, for example, reports that Yoloy will take a 180-degree bend without developing edge cracks. And material at the weld and immediately next to it has the same high quality as the parent metal.

The customer gets other advantages, too. With Yoloy steels, you can design with lighter gauges and have the same strength. On trucks, like those illustrated, it means more payload, less deadweight. High resistance to corrosion of Yoloy "E" means longer life and less maintenance. And it has high resistance to shock and vibration.

Whatever you fabricate, chances are you can benefit by using one of the Yoloy family of steels. Yoloy is available in sheets, plates, strip, pipe, mechanical tubing, bars, shapes and cold finished bars. All made by Youngstown.

Photos courtesy of Specialty Engineering Co.

THE YOUNGSTOWN SHEET AND TUBE COMPANY *Manufacturers of Carbon, Alloy and Yoloy Steel*

General Offices Youngstown, Ohio District Sales Offices in Principal Cities

SHEETS - STRIP - PLATES - STANDARD PIPE - LINE PIPE - OIL COUNTRY TUBULAR GOODS - CONDUIT AND EMT - MECHANICAL TUBING - COLD FINISHED BARS - HOT ROLLED BARS - WIRE - HOT ROLLED RODS - COKE TIN PLATE - ELECTROLYTIC TIN PLATE - BLACK PLATE - RAILROAD TRACK SPIKES - MINE ROOF BOLTS

model and the series 20 recirculating heater are to be made available for six and 12-v electric systems. Featuring pressure-forced heat, originating in a blower equipped with a high-speed impeller operating up to 3000 rpm, the series 55 refills its core with hot water every two seconds at normal driving speeds and all the air in a sedan is recirculated during a two-minute time span. With defroster-fresh air kit the series 55 heater fits 1955 Ford and Chevrolet passenger cars, and as a recirculating heater it fits 1955 Plymouth, Ford and Chevrolet cars.

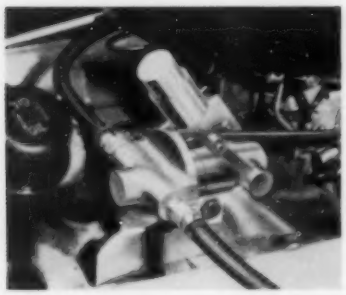
Developed around a high-resistance core which increases the velocity of fresh air under pressure, the series 55 receptacle fitting into the car's own air intake system receives fresh ram air and diverts it to the pressure blower and the heating unit. The heater can be shut off for summer driving and the remaining parts of the system employed to provide fresh air circulation.

The series 20 recirculating unit fits most new and old passenger cars and trucks including 1955 Ford and Chevrolet passenger cars and Chevrolet trucks. Its core has 2800 sq in. of radiating surface. The eight-blade, seven-in. fan moves 150 cu ft of warm air per minute and circulates all air in an average-sized sedan every two minutes. Horizontal vents across the front and side assure complete warm air distribution to right, left and front.

Automatic Brake

An automatic brake for automobiles, trucks and buses that is said to reduce stopping distances up to 60 per cent has been introduced by the *Automatic Brake Div., of Hemphill, Inc., Box* 331, *Gowanda, N. Y.* A metering control valve is mounted on the engine or firewall and powered by vacuum. It eliminates the use of the conventional foot brake pedal and operates in conjunction with the accelerator and brake system of the vehicle.

With the new unit installed, one in. is added to accelerator travel, which



is divided into three zones of operation. The first ¾ in. is the braking zone, the next ¼ in. is for neutral or coasting, and the balance of travel is for acceleration. The vehicle is stopped by relaxing the foot pressure on the accelerator. It reportedly will not lock the wheels on dry pavement and provides improved skid control on slippery surfaces.

An additional convenience and safety feature of the system is the Cruise Control. This feature is operated by pressing a button on the dash while traveling at the desired speed. The foot is then removed from the accelerator and the button released. The set speed will be maintained automatically until the accelerator is depressed slightly, disengaging the Cruise Control and returning the system to manual operation. During an emergency, the driver can tap the

(Turn to page 158, please)

SYSTEM-ENGINEERED METAL-CLAD

G-E switchgear guards power continuity

G-E metal-clad switchgear is engineered to provide the maximum protection against power shutdowns which production line operation demands. As automotive processing becomes more and more continuous, you require greater assurance against power interruptions.

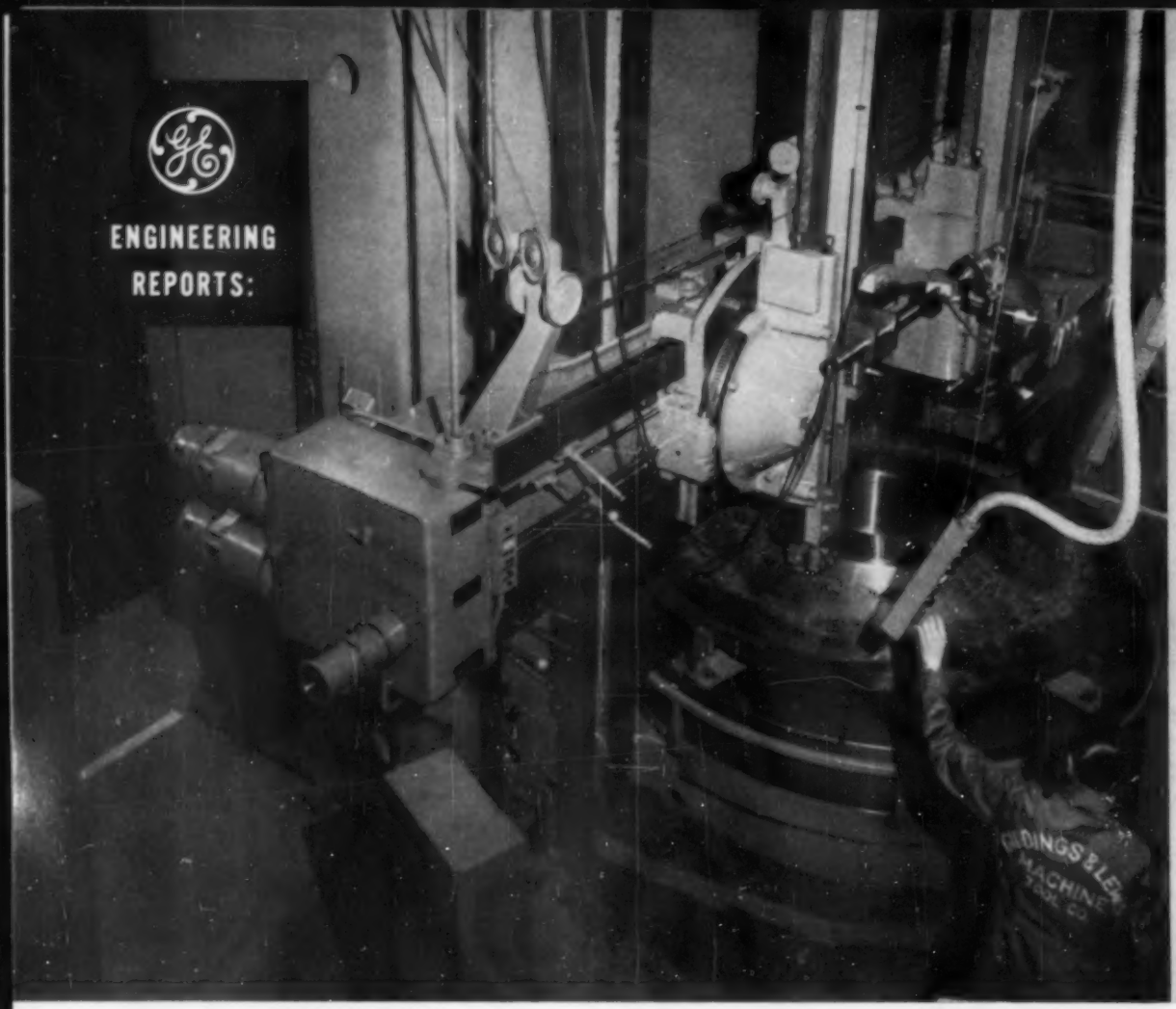
Metal-clad switchgear is engineered by G.E. to exceed the most rugged duty requirements in factory pre-assembled units that are easy to install and maintain. The complete line includes light-duty metal-clad up to 50 MVA and 4.16 kv; heavy-duty metal-clad up to 13.8 kv—with advanced-design magne-blast circuit breakers.

G-E engineering know-how is available to you *in the planning stage* to help you select your power equipment not only for present needs, but also for the predicted expansion of the industry.

The up-to-the-minute production machinery described on the following pages will illustrate your need for planned power.

TURN PAGE FOR SYSTEM STORY . . . ▶

GENERAL ELECTRIC



SYSTEM-ENGINEERED . . .

G-E devices power and control new production

G-E engineering know-how helped co-ordinate the electrification of this Giddings and Lewis 8-foot vertical boring mill which can save up to 47% machining time with improved surface finish. Recently exhibited at the Machine Tool Show in Chicago, the G-E drive provides electronic two-dimensional-tracing, constant surface cutting speed as the diameter of the work changes, and maintains constant chip thickness. All these operations are obtained simultaneously.

G.E.'s two-dimension tracer head controls the ram and saddle motions. Each of these motions has a $1\frac{1}{2}$-hp d-c motor, amplidyne-generator feed drive which permits the cutting tool to move completely around the work (360° profiling) in any pattern dictated by the template.

A G-E 75-hp electronic Speed Variator drives the main table. A potentiometer sensing element mounted on the left rail head sends signals to the Speed Variator. This maintains constant surface cutting speed over a 20:1 range of work diameters.

The tracing speed of the left rail head is automatically adjusted by another control system so that constant chip thickness is assured when the table speed is changed manually or by the constant cutting speed control.

Similar G-E engineering service is available to you and your machine tool builders to help make your processing more continuous, productive and profitable. For details of these systems, write for bulletin GEA-6122, G-E Tracer Control, and GEA-6127, Speed Variators.

GENERAL ELECTRIC

G-E ENGINEERS helped plan electrification of Giddings & Lewis boring mill. Speed Variator, above, maintains constant speed of table. (Lower photo.)

machines

BENEFIT FROM G-E PRODUCT ENGINEERING . . .

Design in TRI 55 CLAD motors

Reg. U.S. Pat. Off.

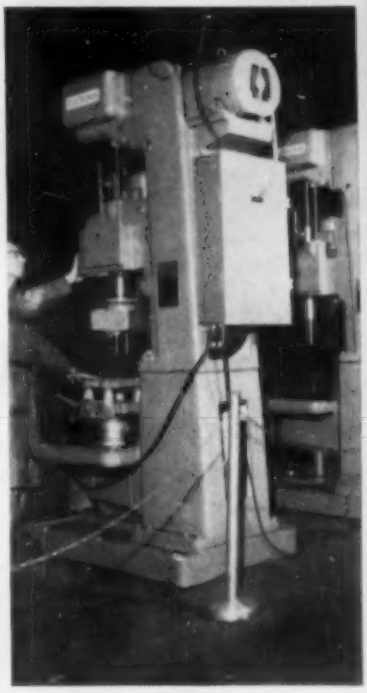
Be sure your new production machinery is equipped with Tri-Clad '55' motors. The benefits tool builders receive when they design in Tri-Clad motors are passed on to you in lighter, more compact and modern-appearing equipment. These long-life motors mean less maintenance and greater operating economy for you. These features are prompting the big "motor switchover." At the recent Machine Tool Show, for example, over 62% of the G-E motors between 1 and 30 horsepower were built to the new dimensions.

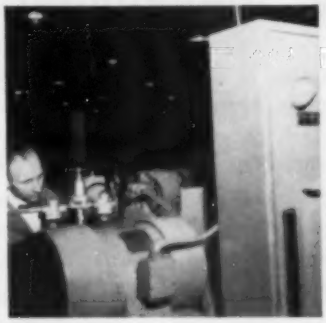
For details on how G-E Tri-Clad '55' motors will keep your production moving, write for bulletin GEA-6013.

The Goss & DeLeeuw Machine Company uses Tri-Clad '55' totally enclosed motors in the 1–15-hp range for the tapping, drilling and feed drives on its automatic chucking machine (upper right photo).

The Cleereman Machine Company exhibited its new Series A Automatic Drilling and Tapping machines powered by G-E Tri-Clad '55' motors.

The Van Norman Company uses G-E Tri-Clad '55' motors to drive the wheel head on this new grinder.





CHECK COUPON BELOW FOR DESCRIPTIVE BULLETINS

General Electric Company
Apparatus Sales Division
Section B651-10
Schenectady 5, New York

Please send me the following bulletins describing G-E products for the automotive industry:

- ☐ GEA-5664 G-E Metal-clad Switchgear
- ☐ GEA-6122 G-E Tracer Control
- ☐ GEA-6127 G-E Speed Variators
- ☐ GEA-6013 G-E Tri-Clad '55' Motors
- ☐ GEC-970A G-E Automatic Plating Rectifiers

Name .....

Company .....

Street .....

City ..... State .....

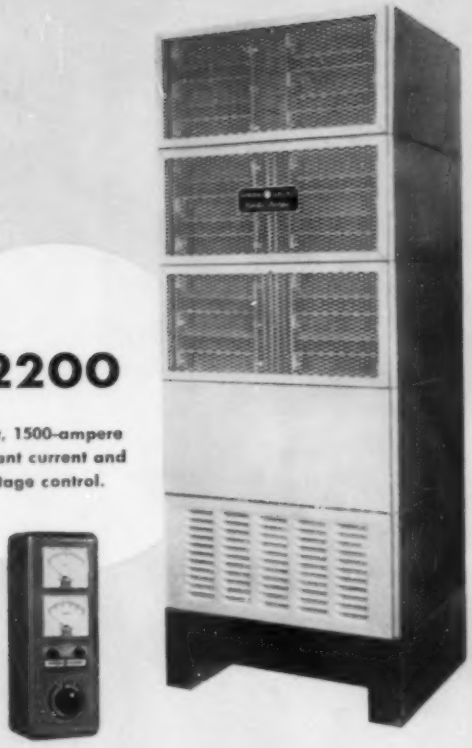
TURN PAGE FOR MORE PRODUCT HIGHLIGHTS

$1440

12-volt, 500-ampere constant voltage control.

$2200

9-volt, 1500-ampere constant current and voltage control.



Low price announced on G-E platers

You're assured of uniform plating at a new low cost with G-E automatic plating rectifiers. In addition to the units illustrated, check these manufacturer's prices on larger units: $8860 for the 24-volt, 4000-ampere unit with automatic anodizing control; $10,080 for the 9-volt, 10,000-ampere unit with automatic voltage control; $8380 for the 24-volt, 3000-ampere unit with automatic anodizing control and sealed, oil-cooled stacks.

In addition to lower initial cost, these units also save operating costs in these three big areas:

(1) **LABOR**—No one needs to stand by the controls to adjust for changes in the tank load. Plating operators can be freed for other operations.

(2) **SPOILAGE**—Spoilage is reduced, since deposition is kept uniform by the constant current or voltage. This reduction in spoilage means fewer rejects—less re-working expense.

(3) **MAINTENANCE**—Maintenance is kept low, because both the G-E automatic control and rectifier are mechanically static. Except for the cooling fan, there are no moving parts.

Operation is easy. The desired anodizing sequence is set up by the operator at the rectifier control panel. Once set, the sequence is completely automatic, requiring no further adjustment. Remote-control station can be conveniently located within easy reach of the operator right at the anodizing tank. Check coupon on preceding page for Bulletin GEC-970A. General Electric Company, Schenectady 5, N. Y.

Engineered Electrical Systems for the Automotive Industry

GENERAL ELECTRIC

Procurement officials in the Defense Dept. are scheduling a set of "round-table" talks with concerns engaged in defense work or capable of taking on defense work. Pentagon wants to make sure it is keeping up with latest wrinkles in production techniques.

Navy technicians are making complete tests of a new Westinghouse turbojet plane engine. Westinghouse built the engine, designated the J-54 by the Navy, in cooperation with Rolls Royce, Ltd.

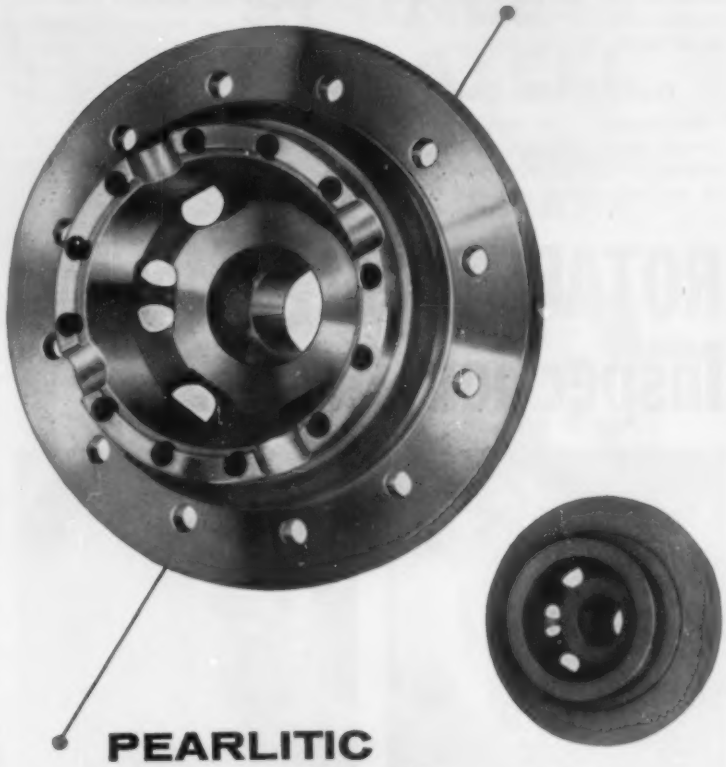
Air Force is beginning to close out its B-47 medium bomber program. More than 1700 of the six-jet planes are now on hand.

U. S. Patent Office states that there is a serious delay in the processing of patent applications due to a deficiency in the size of its examining staff. Qualified technically and scientifically trained personnel interested in patent work are urged to apply to Commissioner of Patents, Washington 25, D. C.

Turboprop engines, rather than jets, appear to be shaping up as the dominant means of aircraft propulsion of the not-too-distant future. Some Government aircraft engineers believe the bulk of U.S. commercial flying will be powered by turboprop engines.

Economic indicators of interest to industrial and commercial firms are rounded up in a new edition of a basic reference volume prepared by Commerce Dept. called "Business Statistics," it is sold at $2 per copy at Commerce Dept. field offices and by the Government Printing Office, Washington 25, D. C.

MACHINABILITY INDEX 80-90*



PEARLITIC MALLEABLE CASTINGS

* B1112 STEEL = 100

Low machinability index of 80-90 (B1112 steel = 100) is probably reason enough to warrant serious consideration for your product.

But pearlitic malleable castings—from National—don't stop there. They have great ultimate strength . . . resist wear under heavy loads at high speeds . . . make excellent non-seizing bearings . . . can be air or liquid-quenched . . . can be smooth-finished.

Don't overlook the advantages of pearlitic malleable. For pearlitic malleable castings—from National—can often reduce manufacturing costs, weight and assembly time . . . can increase the sales potential of your product.

AA-1096

NATIONAL MALLEABLE AND STEEL CASTINGS COMPANY

Cleveland 6, Ohio

The Nation's largest independent producer of malleable and pearlitic malleable

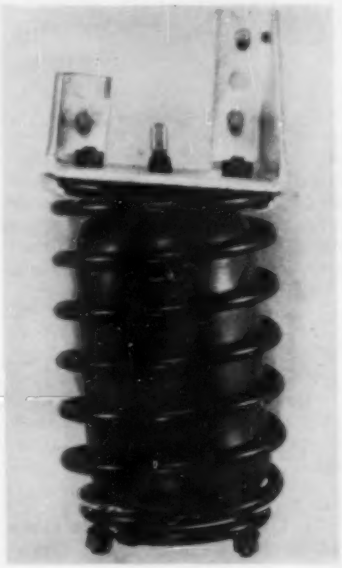
(Continued from page 152)
horn ring and the Cruise Control will disengage simultaneously with the automatic application of brakes for an emergency stop. During an emergency stop, the driver can depress accelerator to control the stop or to resume speed. No cycle need be completed before starting another.

Gas-Per-Mile Gage

Development of a new Lectrotest electric gas-per-mile gage which may be used on cars equipped with either six or 12-v electric systems is announced by *Kent-Moore Organization, Inc., 5-105 GM Bldg., Detroit 2, Mich.* It is designed to hook up to any car in less than five minutes. With hoses connected to fuel line and carburetor and lead wires clipped to hot battery terminal ground, the gage is mounted to the front door window. In addition to this visible evidence, the gage is also equipped with its own self-contained fuel pump which eliminates surge in gas lines and which also emits a distinct sound signal which multiples in frequency as gasoline consumption increases.

Booster Spring

A specially designed pneumatic spring booster has been authorized by Packard as a Torsion-Level suspension. The new units, made by *Air Lift Co., 28 Jefferson Ave., S. E., Grand Rapids, Mich.*, for added support in towing trailers or other over-



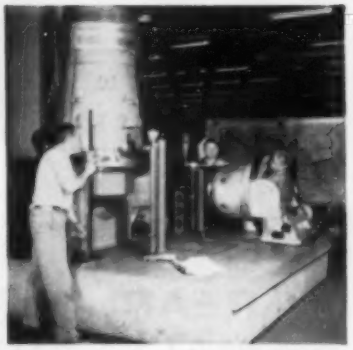
load, are said to provide the desired assist yet retain almost the normal ride when not towing. The spring boosters are heavy butyl chambers enclosed in coil springs. Inflated with air they absorb stress of overloads up to 1500 lb. The new Packard model is designed to bolt between torque arm and frame. The only alteration required is repositioning of the brake line hose fitting.

Oil Temperature

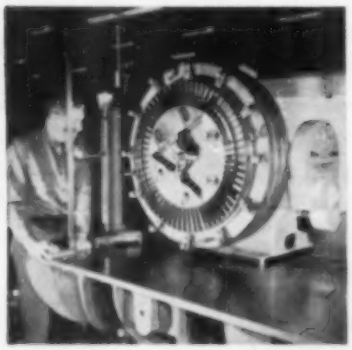
Continental Thermotrol Inc., Falmouth and Denton Aves., New Hyde Park, N. Y., has redesigned its Hoskinson Thermotrol to a one-piece unit. The unit is a heat exchanger which regulates the engine oil temperature. It is connected to the oil header line and clamped to the exhaust pipe.

ROTABS Beat Precision Inspection Costs...

This 24" ROTAB plus centering fixture cuts checking time for 11 dimensions on six vane segments from several hours to 5 minutes each.



Checking big jet engine assemblies is fast and simple on ROTABS (36" & 48"), eliminates costly fixtures made obsolete by engineering changes.



Seconds-of-arc precision allows quick, accurate inspection with low cost standard gages. Here 36" powered unit checks vane spacing.

For small parts inspection this 12" universal ROTAB minimizes setup and inspection time, does not require power for tilting and rotation.

For complete data on the optical precision readings you get with the ROTAB at the lowest cost, write:

MACHINE PRODUCTS CORP.
6771 East McNichols Road Dept. A DETROIT 12, MICH.

DISSTON STAINLESS STEEL

...hot rolled to SHAPE

saves steel · tooling · machining

Stainless steel users receive many advantages by ordering Disston steel shapes accurately rolled to their specifications.

LESS MACHINING. Tool operations are simplified, for Disston shapes are rolled to precision tolerances, have exceptionally fine finishes.

REDUCTION IN WASTE MATERIAL. Preshaped Disston steel reduces scrap losses. One well-known manufacturer saved 47% of stainless steel tonnage by starting with a rolled Disston shape—instead of a rectangular section.

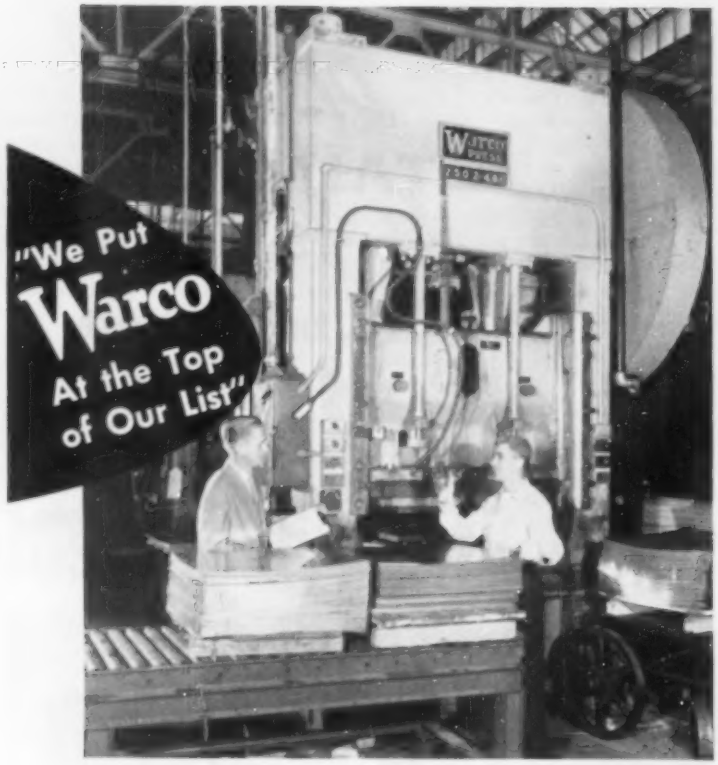
LOW-COST HANDLING OF SMALL ORDERS. Jobs as little as five or ten tons on a particular shape are rolled easily, economically in the Disston mills. Over 100 years of leadership in the rolling of special shapes gives Disston the edge in metal-shaping skill and technique.

Why not talk over your requirements with a Disston representative? Learn how much you can save by using Disston stainless steel shapes. Or write to:

Henry Disston & Sons, Inc., Steel Sales Division
1231 Tacony, Philadelphia 35, Pa., U.S.A.

DISSTON HAS THE EDGE®
in special purpose steels
and special steel shapes.

100 YEARS OF FINE STEEL MAKING



Nesco Plant Manager Gives Efficiency, Economy and Ease of Operation as Reasons for Selecting Warco Presses

"I would say that our experience with Warco equipment has been very satisfactory. We have many of these presses in our factory and are well satisfied with their operation. I feel that from the standpoint of efficiency, economy and ease of operation that Warco equipment is right at the top of our list." This from Martin M. Fisher, Plant Manager of the Nesco Division of New York Shipbuilding Corp., one of the nation's foremost producers of quality housewares.

Mr. Fisher's comments are echoed wherever Warco presses are in operation, for when users compare, they invariably find Warco performance to be superior.

If you are not already operating Warco equipment, why not let us put you in touch with someone who is? We know once you've talked with a Warco user, you'll be certain to add our name to your press supplier list.

-Federal- WELDERS

Warco PRESSES

The Federal Machine and Welder Company

WARREN, OHIO

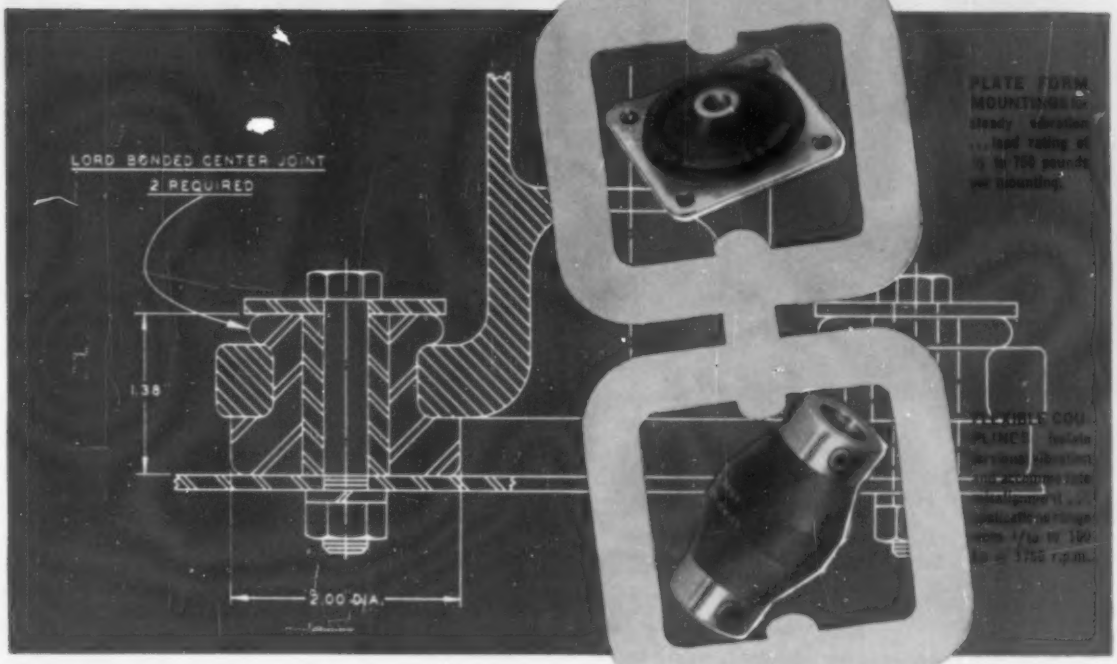
CALENDAR

OF COMING SHOWS AND MEETINGS

First Mexican International Automobile, Motor, and Cycle Show, Mexico City .....Jan. 1-10
Chicago Automobile Show, Chicago, Ill. .....Jan. 7-15
SAE Annual Meeting, Sheraton-Cadillac and Statler Hotels, Detroit, Mich. .....Jan. 9-13
National Motor Boat Show, Kingsbridge Armory, New York, N. Y. Jan. 13-22
Society of Plastics Engineers, annual conference, Hotel Statler, Cleveland, O. .....Jan. 18-20
General Motors Motorama, Waldorf-Astoria Hotel, New York, N. Y. Jan. 19-24
Sports Car Club of America, annual business meeting, Sheraton-Cadillac Hotel, Detroit, Mich. Jan. 20-21
National Plant Engineering and Maintenance Show, Convention Hall, Philadelphia, Pa.....Jan. 23-26
NAPA Annual Convention, Washington, D. C. .....Jan. 28-Feb. 1
AIEE Winter General Meeting, Hotel Statler, New York, N. Y. Jan. 30-Feb. 3
Automotive Accessories Mfgrs. of America Exposition, Navy Pier, Chicago, Ill. .....Feb. 6-9
SPI Reinforced Plastics Div. Conference, Hotel Chalfonte-Haddon Hall, Atlantic City, N. J..Feb. 7-9
NSPA Convention, Mark Hopkins Hotel, San Francisco, Calif. Feb. 21-22
Pacific Automotive Show, Civic Auditorium, San Francisco, Calif. .....Feb. 23-26
AMA Electronics Conference, Hotel Commodore, New York, N. Y. Feb. 27-29
SAE National Passenger Car, Body, and Materials Meeting, Hotel Statler, Detroit, Mich. .....Mar. 6-8
Geneva Automobile Show, Switzerland .....Mar. 8-18
National Association of Corrosion Engineers, annual convention, Hotel Statler, New York, N. Y. Mar. 12-16
Association of National Advertisers, spring meeting, Homestead, Hot Springs, Va. .....Mar. 14-16
SAE National Production Meeting and Forum, Hotel Statler, Cleveland, O. .....Mar. 19-21
ASTE Industrial Exposition, International Amphitheatre, Chicago, Ill. .....Mar. 19-23
SAE Aeronautic Meeting and Production Forum, and Aircraft Engineering Display, Hotel Statler, New York, N. Y...April 9-13
National Packaging Exposition, Convention Hall, Atlantic City, N. J. .....April 9-12
MPA Annual Meeting and Metal Powder Show, Hotel Cleveland, Cleveland, O. .....April 10-12
National Petroleum Institute, semi-annual meeting, Cleveland Hotel, Cleveland, O. .....April 18-20
Turin Motor Show, Italy..April 21-May 2
British Industries Fair, London and Birmingham, England April 23-May 4
International Automobile Show, Coliseum, New York, N. Y. April 28-May 6
Chamber of Commerce of the U. S., annual meeting, Washington, D. C. .....April 30-May 2
Design Engineering Show, Convention Hall, Philadelphia, Pa..May 14-17

LORD CONTROLS VIBRATION...ANYWHERE!

THE MOST POSITIVE BOND OF PRODUCT TO PERFORMANCE



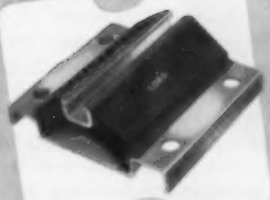
Vibration control is a vital element of improved product performance . . . and the most positive way to control vibration is through LORD Bonded-Rubber Mountings. Here are several outstanding reasons why:

Isolate Vibration — Stop noise transmission or vibration caused by moving mechanical components.

Lengthen Product Life — minimize stresses caused by shaft misalignment or torsional vibration.

Reduce Maintenance Expense — the rubber element absorbs flexing action . . . no surfaces to wear or chafe . . . no lubrication is needed.

LORD maintains a staff of vibration engineers to assist manufacturers in isolating destructive vibration. They will gladly assist you by designing and producing the most economical and efficient mounting for your needs. Call or write the LORD Mfg. Co., Erie, Pa.



CHAN-L-MOUNTS provide excellent reduction of steady vibrations and occasional shock problems. Designed to provide maximum deflection for their size.

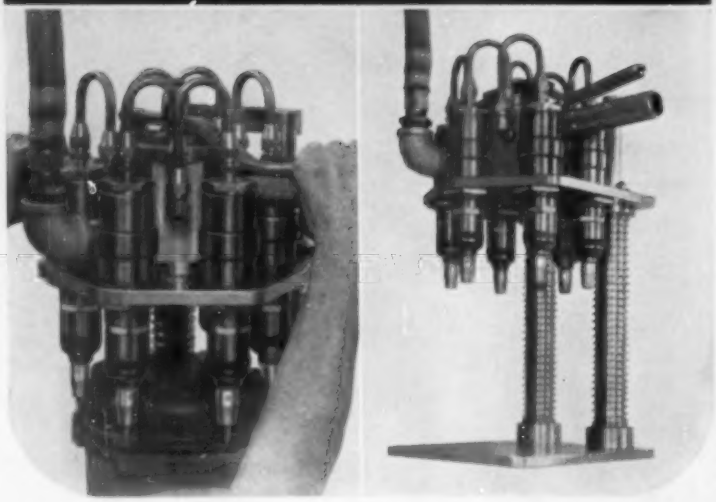
LORD MANUFACTURING COMPANY • ERIE, PENNSYLVANIA

LOS ANGELES, CAL. HOllywood 4-7983 · DALLAS, TEXAS Riverside 3392 · DETROIT, MICH. TRinity 4-2060 · NEW YORK, N. Y. Circle 7-3326
PHILADELPHIA, PENNA. LOcust 4-0147 · DAYTON, OHIO Michigan 8871 · CHICAGO, ILL. Michigan 2-6010 · CLEVELAND, OHIO SUperior 1-3242

LORD BONDED RUBBER

DESIGNERS AND PRODUCERS OF BONDED RUBBER PRODUCTS SINCE 1924

BUCKEYE multiple-unit fastening and drilling tools reduce assembly time and costs on any operation involving two or more fasteners.



Now—an entire assembly operation, where two or more fasteners are used, can be completed in the same time required to drive a single fastener. The savings you can make will increase directly with the number of tools in your Buckeye multiple-unit tool. You decide how many screws or nuts you wish to drive—simultaneously . . . or how many holes you want to drill—simultaneously . . . you're limited only by the air supply available in your plant.

Tools can be positioned to match any horizontal drilling or fastening pattern, and to compensate for any differences in vertical position of screws, nuts or workpiece. A Buckeye multiple-unit tool will drive screws and nuts of different sizes and types . . . will drill holes of different sizes and depths—and do either job simultaneously. Tool capacities, in multiple units, are identical to individual tool capacities.

Buckeye multiple-unit fastening and drilling tools are engineered to your specific requirements. They may be arranged on self-supporting arms, as illustrated, or designed for suspension above the work. Just send a letter or sketch, outlining your assembly operation, or ask to have a Buckeye Tools Sales Engineer visit you. Either way, it costs you nothing to learn how you can step up assembly output and cut assembly costs—simultaneously.

Buckeye Tools CORPORATION
DIVISION 21 • DAYTON 1, OHIO

producers of the world's first successful rotary air tools

SHORTIES

At an average of 30 mph, it would take an automobile more than 11 years to travel over the 3,012,520 miles of rural roads in the U. S. today.

●

Over half of 63 major U. S. markets receive 90 per cent, or more, of livestock via highway transportation. Ten markets receive all livestock by truck.

●

Total rural and urban mileage in Texas is equal to more than nine times the equatorial diameter of the earth.

●

Each new jet fighter is put through more than 40 different rigorous test flights and checks before its delivery to the military.

●

A typical modern jet fighter contains enough electrical wiring to complete the electrical circuits of 38 six-room houses.

●

Fighter production of a typical aircraft manufacturer, during 1954, required: 12.14 million lb of aluminum, 1.517 million lb of stainless steel, 168,000 lb of rivets, and 5202 miles of electric wire.

●

The American motorist in one year consumes enough gasoline to fill a 29½-in. pipe line stretching from here to the moon.

●

If all the registered motor vehicles in the U. S. were lined up bumper to bumper, the line would stretch from New York to San Francisco about 70 times.

●

In 1954, 35,500 Americans were killed in traffic accidents.

●

The largest tonnage item used in iron and steelmaking is water. Nearly 13 billion tons of it was used by blast furnaces, steel plants and rolling mills in a recent year.

STEEL STAMPING DOES IT BETTER . . . ACKERMANN-WHEELING DOES IT BEST!

There's an idea here for YOU!

This complex stamping is a side of the new "Band Box*," Ackermann-Wheeling's nestable all-steel shipping container.

In addition to being unusually difficult, this stamping represents how one job was carried from conception to completion: solved, tooled, mass produced, assembled . . . all accomplished efficiently, economically.

This will give you some idea of the versatility, ingenuity and completeness of Ackermann-Wheeling's services. It is this resourcefulness that may explain why *Ackermann-Wheeling has never failed to complete a job due to inability to solve it or inability to produce it!*

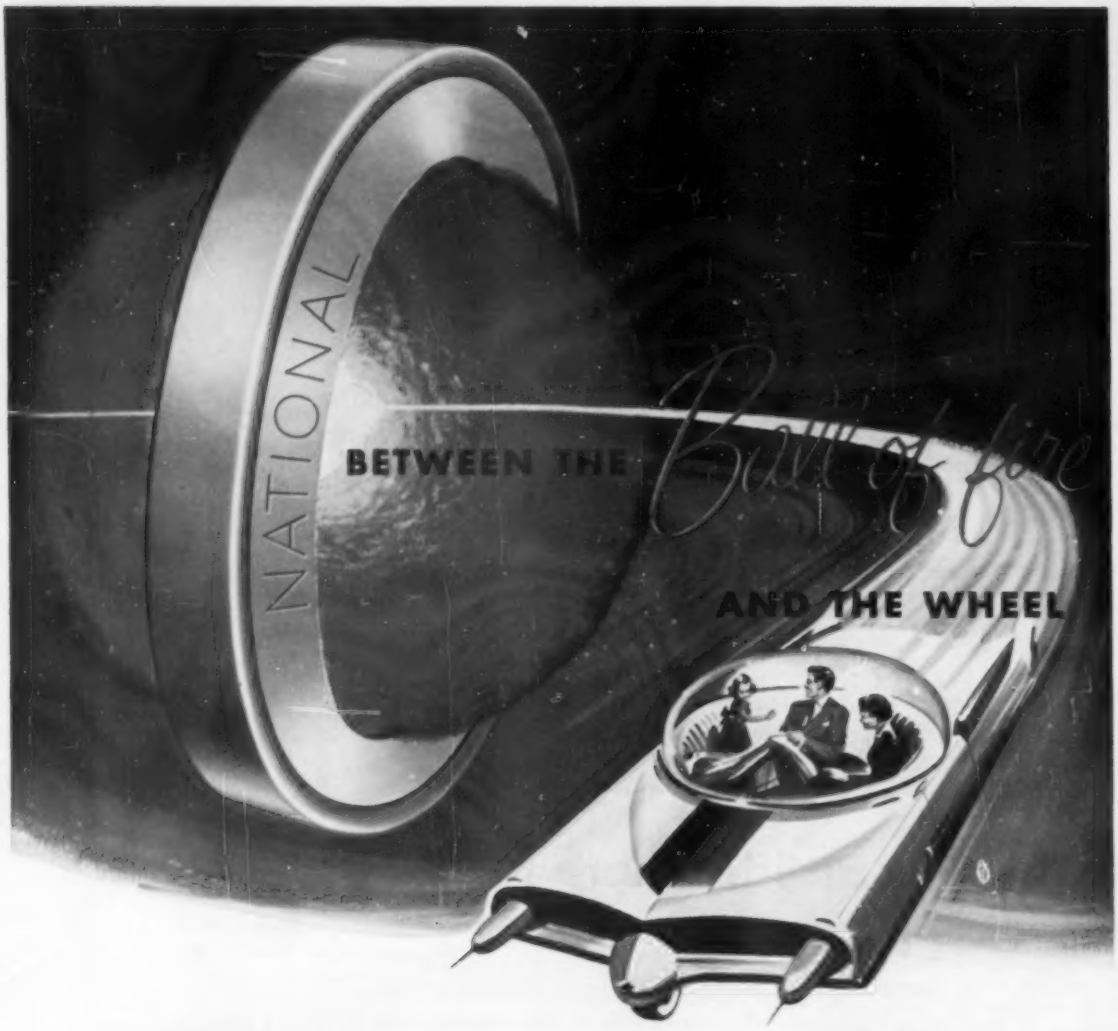
"THE BAND BOX" is Ackermann-Wheeling's new fully nestable, self-palletized steel shipping container. Engineered to specific requirements. Send for full details.
* Pat. applied for

ACKERMANN WHEELING

Put this team of production experts to work for *you*. For complete details on Ackermann-Wheeling services write, wire or call.

Engineered Stampings

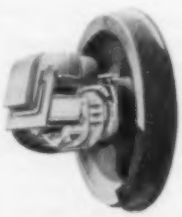
ACKERMANN MANUFACTURING COMPANY
WHEELING • WEST VIRGINIA



Motor cars of tomorrow will be swift and silent beyond belief, powered by the mightiest forces man can employ. Perhaps this power is nuclear, perhaps from a chemical fuel. From either will come the "release explosion"—a swirling "ball of fire"—pure energy to be contained, controlled, delivered to the wheels.

Oil seals will shoulder much of the responsibility. Besides sealing dirt out and lubricant in, seals will serve as air, fuel and even pressure seals. They must withstand shaft speeds to 60,000 rpm at pressures of 60 psi and temperatures to 500°.

National Motor Bearing's advance engineering program for the future brings about many "years ahead" developments in National products of today.



Sealing Achievement! New NMB Sealed Journal Box Kit* converts standard journal assemblies in freight cars to sealed bath lubrication. This recent development virtually solves the 100-year-old railroad "hot box" problem. It can eventually save railroads over $200 million annually. *Pat. & Pats. Pend.

NATIONAL MOTOR BEARING CO., INC.

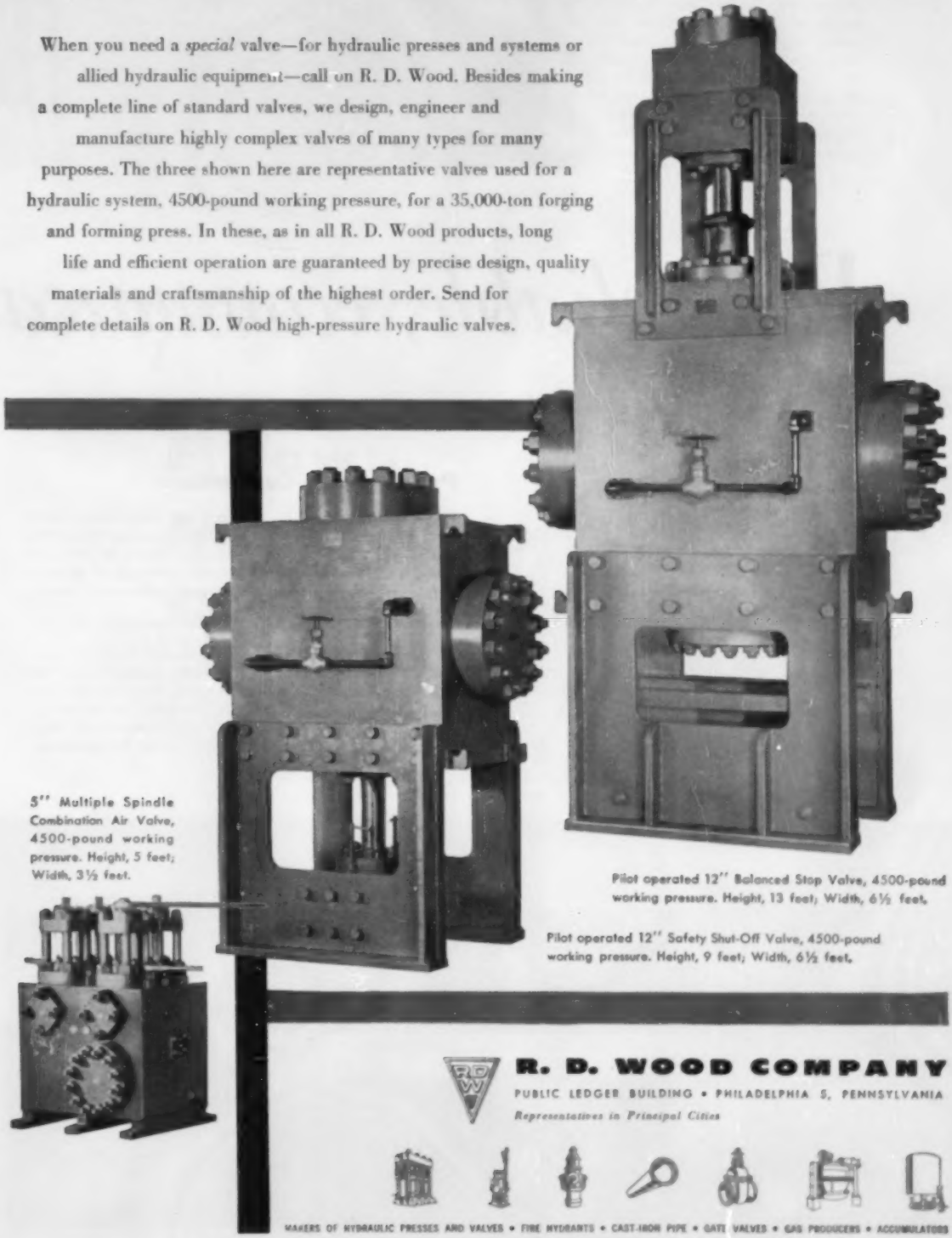
General Offices: Redwood City, California. Sales Offices: Chicago, Cleveland, Dallas, Detroit, Downey (Los Angeles County), Indianapolis, Milwaukee, Newark, Van Wert, Wichita. Plants: Redwood City, Downey and Long Beach, California; Van Wert, Ohio.

NATIONAL OIL SEALS

1067

SPECIALISTS IN HIGH-PRESSURE VALVES

When you need a *special* valve—for hydraulic presses and systems or allied hydraulic equipment—call on R. D. Wood. Besides making a complete line of standard valves, we design, engineer and manufacture highly complex valves of many types for many purposes. The three shown here are representative valves used for a hydraulic system, 4500-pound working pressure, for a 35,000-ton forging and forming press. In these, as in all R. D. Wood products, long life and efficient operation are guaranteed by precise design, quality materials and craftsmanship of the highest order. Send for complete details on R. D. Wood high-pressure hydraulic valves.



5" Multiple Spindle Combination Air Valve, 4500-pound working pressure. Height, 5 feet; Width, 3½ feet.

Pilot operated 12" Balanced Stop Valve, 4500-pound working pressure. Height, 13 feet; Width, 6½ feet.

Pilot operated 12" Safety Shut-Off Valve, 4500-pound working pressure. Height, 9 feet; Width, 6½ feet.

R. D. WOOD COMPANY

PUBLIC LEDGER BUILDING • PHILADELPHIA 5, PENNSYLVANIA

Representatives in Principal Cities

MAKERS OF HYDRAULIC PRESSES AND VALVES • FIRE HYDRANTS • CAST-IRON PIPE • GATE VALVES • GAS PRODUCERS • ACCUMULATORS

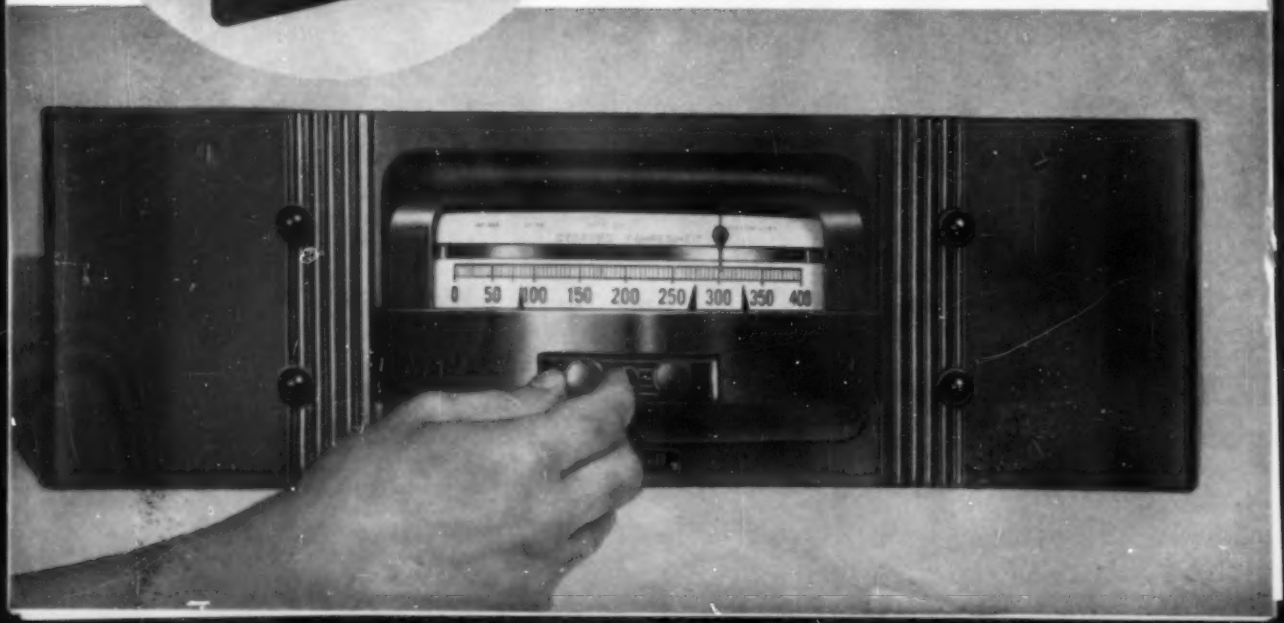
For reliable, economical

Pyr-O-Vane Controllers

Horizontal-case model fits standard 19" relay racks. Available in a choice of control actions, including three-zone control with neutral zone adjustable from 0 to 100°, or 0 to 10°. Pre-wired panel permits checking of thermocouple or millivoltmeter without disconnecting wiring.

Vertical-case model can be flush or surface mounted.

Both types are available with "snap action" electronic vane control; on-off, two-position and three-position; and with pulse-type time-proportioning control. They are designed for fail-safe operation, and are virtually unaffected by changes in line voltage, humidity and temperature. Supplied with either thermocouple or *Radiamatic*® calibrations.



Protect-O-Vane Excess Temperature Safety Cut-Off

Now available in both horizontal- and vertical-case models, *Protect-O-Vane* instruments afford economical insurance against overheat damage to expensive furnaces. They operate in conjunction with primary controllers . . . which may be either *Pyr-O-Vane* models or recording instruments . . . to close the fuel valve or open electric heating circuits whenever the safe temperature limit is exceeded. At the same time, they can actuate signal lights or audible alarms. Their safety circuit prevents re-starting the process until temperature has dropped below the safe limit.

temperature control...

BROWN MILLIVOLTMETER CONTROLLERS

LOOKING for versatile, dependable, economical control? Then choose from the line of Brown millivoltmeter controllers. This varied family of instruments fills the requirements of hundreds of temperature control applications where a chart record is not essential. On ovens, dryers, furnaces, plating tanks, plastic presses and other heat-using equipment, they bring sensitive, reliable control within the reach of any budget.

Built into these instruments are numerous advanced design features. Both *Pyr-O-Vane* Controllers and *Protect-O-Vane* Safety Cut-Offs have a high-resistance galvanometer circuit that minimizes effects of varying length of extension wires . . . 6-inch scale with anti-parallax mirror . . . readily accessible zero adjustment. Plug-in galvanometer and control units reduce replacement time to seconds.

Both the *Pyr-O-Vane* and *Protect-O-Vane* types of instruments are now available in two case styles: the conventional vertical case, to fit installations where width is restricted; and the new horizontal case, which takes only a few inches of vertical mounting space.

Behind all these instruments stands more than 90 years of experience with millivoltmeter instrumentation . . . plus the nation-wide engineering and field service facilities of the Honeywell organization. For a discussion on how these economical controllers can be put to work on your processes or on the equipment you manufacture, call your local Honeywell sales engineer. He's as near as your phone.

MINNEAPOLIS-HONEYWELL REGULATOR CO., *Industrial Division*, Wayne and Windrim Avenues, Philadelphia 44, Pa.

● REFERENCE DATA: Write for Catalog 1053, "Millivoltmeter Type Instruments" . . . and for Bulletin 1060, "Horizontal Case Millivoltmeter Controllers."

MINNEAPOLIS
Honeywell
BROWN INSTRUMENTS
First in Controls

On the production line in a large midwest automatic transmission plant, a Johnson bearing is pressed into the rear pump housing.

Johnson Bearings Help Maintain Long Service Life In Automatic Transmissions

The long, trouble-free service enjoyed by owners of automatic transmissions produced in this large midwest plant stems from the exacting quality control of all components and operations.

For example, the assembly and testing rooms are air-conditioned and dust-proof. There is no smoking permitted in these rooms. Special care is taken to prevent dust from getting into the transmission. All machines are wiped with lintless rayon cloths. Even the floors of these rooms are coated with oil to keep down dust.

With such close attention to every detail it is easy to understand why Johnson was selected as one supplier of the steel backed bearings, both copper alloy and babbitt lined, used in the assembly. Johnson takes great pains in the manufacture of these bearings to assure that these critical parts will be made of an alloy that is consistent in composition and that the bearings are uniform in size and surface finish.

That's why the coordinator of engineers in this plant reports, "Our assembly lines have never had that first bit of trouble with Johnson bearings. Johnson service is good, too—since our factory buys supplies at a lead time of 10 to 60 days, good service means everything in mass production timing."

This fine acceptance of Johnson quality and service is not unusual in the automotive field, for Johnson is an important supplier of main, cam and rod bearings, and bearings for practically every other component in the modern car, truck or diesel engine made today. To learn more about Johnson quality and service, ask one of our engineers to call. Johnson Bronze Company, 625 S. Mill Street, New Castle, Pa.

Johnson Bearings

QUIET

"Magnamatic" controlled torque screwdriver at work!

CP One-Shot "Magnamatic" is the quietest screwdriver-nutrunner ever developed! Clutch buzz and ratcheting have been eliminated and exhaust noise is effectively muffled by a new principle of baffling.

Quiet One-Shot "Magnamatic" is an air-driven screwdriver-nutrunner that can be set to run nuts and screws to specified torque. Here's how: The Alnico magnetic One-Shot clutch, adjustable to specified torque, disengages completely the instant the fastener is driven to desired tightness. Maintains the selected torque setting indefinitely—prolongs clutch jaw life. Inexperienced operators don't burr screw heads, strip threads, shear fasteners, or damage work. Screw bits last longer.

Only Quiet One-Shot "Magnamatic" has Torque Control PLUS all these advantages:

- Doesn't require frequent readjustment to hold torque value.
- Completely disengages the instant the fastener is run to desired tightness.
- Eliminates stripped threads, sheared fasteners, surface damages.

CAPACITIES: #4 screws to ⅜" bolts.
Reversible and non-reversible types.

Chicago Pneumatic Tool Company, Dept. M-13
8 East 44th Street, New York 17, N. Y.

- ☐ Please send me FREE booklet SP-3165 "Magnamatic Case Histories."
- ☐ Please send me "Magnamatic" Bulletin SP-3126.
- ☐ Have representative call.

Name _____ Title _____
Company _____
Address _____
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Chicago Pneumatic

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PRECISION DESIGNED AND BUILT TO MEET THE REQUIREMENTS OF THE AGE OF AUTOMATION

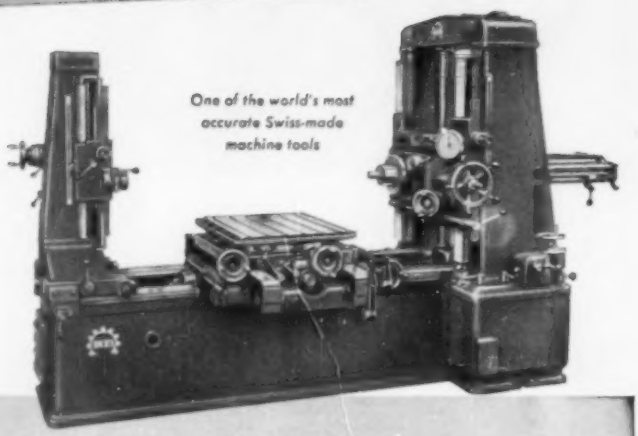
Dixi 60

Horizontal Jig Borer

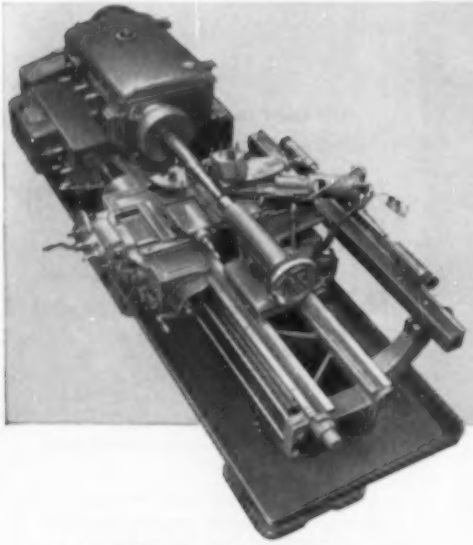
With 5 optical microscopes

A precision machine for boring, drilling, recessing, and milling work. Built-in rotary table with optical microscope can be rotated 360°. Headstock, column, and table settings by optical microscopes to insure overall accuracy of .0002". Table and spindle head have variable hydraulic feed. Mechanical spindle feed can be changed without stopping spindle and is provided with automatic depth stop.

No. 40 taper spindle. Spindle speeds 32-1350 R.P.M. Feeds .0015"—.010" per rev. Table size 28¾" x 32⅝" max. distance spindle to table 19¾". Table travel 23⅝". Spindle travel 24.4".



One of the world's most accurate Swiss-made machine tools



Heavy Duty Lathe *High Precision, Reliability, Top Performance Schaerer Model UN-450*

Twin cross slides. Copies from cylindrical or flat template either longitudinally or cross. Twin slides permit rough turning and finish turning in the same operation in many instances. Swings 17¾" over bed, 9" over carriage, 20-5/64" over gap. Center distance 60". Spindle speeds 31.5 to 1400 R.P.M.

Hydraulic copying attachment can be removed to permit use as a regular twin slide lathe when necessary. 10 H.P. motor drive to spindle. Separate motors for coolant and hydraulic pump. A production lathe built to tool room standards.

- *Guaranteed Service by Trained Staff*
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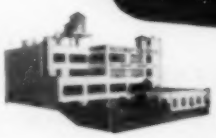


Our Headquarters in New York City

Maximum Rust Protection

and a fine black finish for iron and steel

This long-wearing, rust resistant product is used on many types of iron and steel articles: Nuts and bolts, brackets, screws, nails, springs; tools, casters, padlocks, machine housings and castings; outdoor furniture, hinges, latches, ornamental iron.

Parco Compound is a versatile metal treatment. It is simple to operate, easy to control, dependable and uniform in results, and economical. It creates a dense coating of nonmetallic phosphate crystals over the whole surface of the article treated. There are no limitations on size or shape—any article which can be immersed in the tank can have this protection. Oil, wax, stain, or paint finishes may be used over Parco Compound, to produce maximum rust resistance with deep, velvet black appearance.

1915 40th year 1955

Write for complete information!

*Bonderite, Bonderlube, Parco, Parco Lubrite—Reg. U.S. Pat. Off.

PARKER

RUST PROOF COMPANY

2178 East Milwaukee, Detroit 11, Michigan

PARCO COMPOUND — rust resistant

PARCO LUBRITE — wear resistant for friction surfaces

BONDERITE — corrosion resistant paint base

BONDERITE and BONDERLUBE — aids in cold forming of metals

TROPICAL — heavy duty maintenance paints since 1883

Zagar Gearless Drill Heads

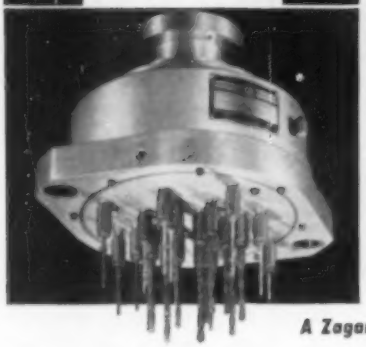
put 4 big advantages to work for you

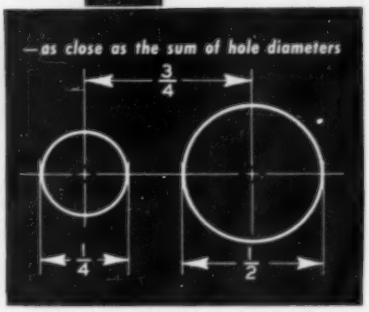
Any number of holes

Any hole pattern

Any material

On all centers



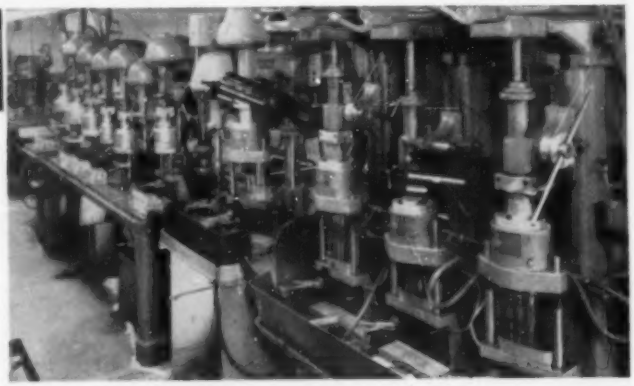


A Zagar drill head is never obsolete. Zagar can re-locate spindles for other hole patterns.

Can you visualize the savings made possible by drilling up to 1000 holes at one pass? Zagar standard practice can handle any machinable material up to 1½" diameter. Holes of varying diameters can be drilled to form any pattern. Zagar Gearless Drill Heads, their efficiency proven by many years' success, can be installed on existing drill presses. Or, Zagar will lay out the necessary tooling for your entire job. May we see your sample parts and study your requirements? There is only one *right* answer—one *best* answer—for those requirements. May we supply it?

Let ZAGAR tooling plan the complete job for you

Whether your runs are long or short, let Zagar engineering survey your needs with a view to saving you the cost of special machines. In the case at the right two lines of *standardized* self-clamping drill jigs ream, tap and drill an aluminum die casting, both valve body and cover. The problem of limited production was readily solved. What, sir, are your requirements?



ZAGAR TOOL, INC. 24000 LAKELAND BOULEVARD, CLEVELAND 23, OHIO

Zagar TOOLS FOR INDUSTRY and SPECIAL MACHINERY

Write for Technical Data Sheets "U-12" for more information.

LOOK TO Guide

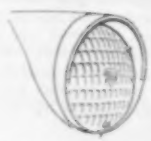
BEST BUYS IN SIGHT!

New outside rear-view mirror, featured on 1956 Cadillacs, is easily adjusted to driver's liking . . . from inside the car!

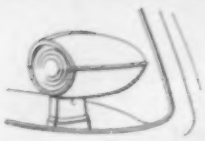
New car prospects can see at a glance that Guide products make driving a lot easier and more enjoyable . . . much safer, too!

Easily demonstrated advantages make them plus features for every car on the floor . . . plus profit makers for every sale!

Guide is continually introducing new developments for better driving vision. Manufacturer, dealer, and buyer can look to Guide for the best buys in sight!

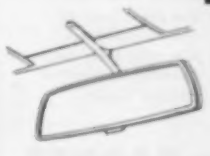


T-3 Safety-Aim Headlamps, Safety-Aimers



Autronic-Eye Automatic Headlight Control

Combination Spot Lamp, Rear-View Mirror



Glareproof Inside Rear-View Mirror

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PRODUCTION
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GREY IRON CASTINGS

ONE OF THE NATION'S
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PRODUCTION FOUNDRIES

ESTABLISHED 1866
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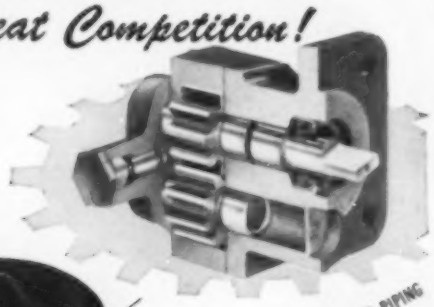
Headquarters for RIVETS
Tubular, split and special cold formed
and Rivet-setting Machines

BARNES PUMPS ARE DESIGNED
to beat Competition!



BUILT-IN RELIEF VALVE SIMPLIFIES PIPING

- Exclusive Gear Tooth Structure
- Spring-Loaded Seal
- Self-Lubricating
- Built-in Relief Valve
- One size — Over 15 different capacities
- Port, Drive Shaft and Mounting Combinations
- Precision tooled

The Barnes Constant-Flo Rotary Gear Pump maintains maximum efficiency with the help of a built-in relief valve, which guards against excessive pressures, and equalizes the fluid pressure over a wide range of speeds. It is built into the pump to simplify the piping, eliminate leakage and facilitate easy maintenance.

The valves are pre-set at the factory, for specified pressure, under conditions duplicating those in which the pump will be used.

JOHN S. **BARNES** CORPORATION
301 South Water Street
Rockford, Illinois

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Please rush full details on Barnes Hydraulic Pumps.

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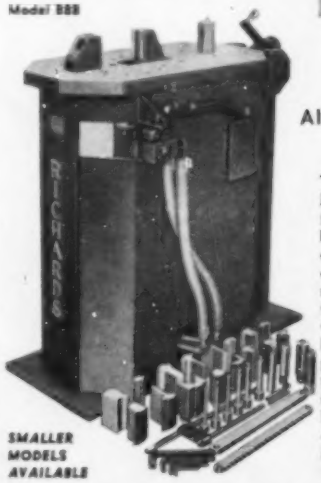
Multiform
BIG BROTHER BENDER

Model BBB



SMALLER MODELS AVAILABLE

Illustrated above are a few of the many forms that can be produced efficiently on the Multiform Bender.

AIR OPERATED MODELS IN FOUR SIZES

The heavy duty Big Brother Bender is designed for fabricating bus bars, brackets, fixtures, etc., without special tooling. Air controlled with finger tip response. Comes complete with dies, mandrels and wrenches — punching and blanking dies extra. Will punch holes up to 1" and form material up to ¼" thick by 4" wide. We also build smaller models, hand or air operated, for bending materials up to ⅛" x 1½".

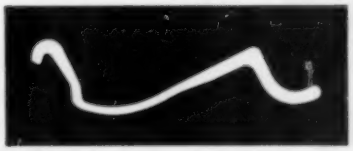
Send for illustrated folder AMI-2

J. A. RICHARDS CO. 903 North Pitcher St. Kalamazoo, Mich.

Rolling Something Special

That "something special" is one of the unusual hot-rolled special sections that we roll at our Johnstown, Pa., plant. Here on the mills of the famous Gautier division we roll some of the trickiest bar shapes known to the trade, as well as a full range of standard bars.

Special sections give you *strength at a saving*. For example, consider the tire rim shown here in section. Notice how hot-rolling puts extra metal where strength is needed. As for economy, you'll find that it often costs less to buy Bethlehem Special Sections, shaped to your require-



ments, than to put standard sections through expensive machining or fabricating operations. And for better surface and more exact dimensions, many sections can then be cold-finished. We ship hot-rolled carbon-steel bars directly to independent cold-drawers for this purpose.

The automotive industry, ever alert to cost-cutting opportunities, uses Bethlehem Special Sections in making starter and generator pole pieces, door hinges, brake shoes and wing bearing cups, to name a few typical applications.

Perhaps you could use special sections to advantage. We'd be happy to discuss it with you. Please contact the Bethlehem sales office most convenient to you.

BETHLEHEM STEEL COMPANY
BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation

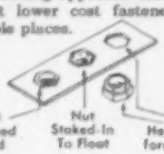
BETHLEHEM STEEL

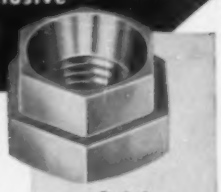
BETHLEHEM STEEL

use these
GRIPCO CLINCH NUTS
with the exclusive
hex on hex
feature

for "fixed" fastenings for "hard-to-reach" or blind assemblies. They wear longer, hold tighter, give greater customer satisfaction.

See how leading appliance manufacturers get lower cost fasteners into inaccessible places.





Typical Applications

Automatic Washer for leg leveling and crating on all appliances

Tractor Seats

Power Lawn Mowers

Automobile Frames

Gripco Clinch Nuts can be either clinched solid for a rigid application or staked in with a six point staking punch to give a floating effect. This floating effect takes care of misalignment and makes the application of the bolt easier. Gripco clinch nuts can be clinched or staked with stationary or portable hydraulic or air equipment. Details on request. Write for samples and data sheet.

GRIP NUT COMPANY 113
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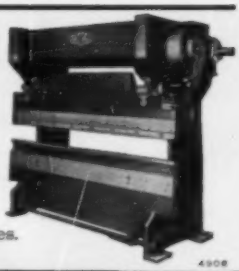
CHICAGO
STEEL
PRESS BRAKES



43 Standard Sizes

DIES Punching and Forming for All Makes and Sizes of Press Brakes.

4908

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CHICAGO
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Stops Losses making Dies and Templates

Popular package is 8-oz. can fitted with Bakelite cap holding soft-hair brush for applying right at bench; metal surface ready for layout in a few minutes. The dark blue background makes the scribed lines show up in sharp relief, prevents metal glare. Increases efficiency and accuracy.

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STURTEVANT
TORQUE WRENCHES
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- Automatic Release
- All Capacities

in inch grams
...inch ounces
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...foot pounds

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DYKEM HI-SPOT BLUE No. 107 is used to locate high spots when scraping bearing surfaces. As it does not dry, it remains in condition on work indefinitely, saving scraper's time. Intensely blue, smooth paste spreads thin, transfers clearly. No grit; noninjurious to metal. Uniform. Available in collapsible tubes of three sizes. Order from your supplier. Write for free sample tube on company letterhead.

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Gear Production Equipment
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Hundreds of manufacturers, including every major auto producer, have found the Flex-Roll pays for itself in a few months by substantially reducing scrap and metal finishing after the draw.

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The McKAY MACHINE Company
YOUNGSTOWN, OHIO

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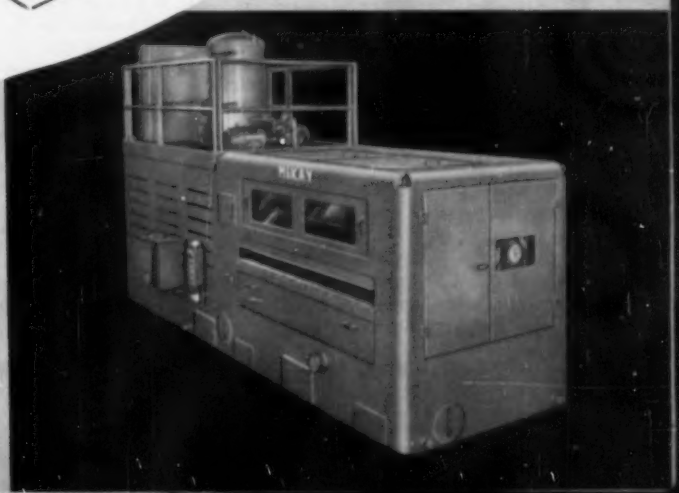
Flex-Roll PROCESSOR



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F. P. Williams, President
S. S. Kresge Company

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regularly and thoroughly read Business Publications ... especially articles covering business trends in merchandise and developments in the retail variety field."

To carry Mr. Williams' thought a step further, men and women who have to keep their thinking a step ahead of their work have one common characteristic. They read thoroughly the publications that give them the most help.

Just as the Kresge executives follow their business publications for trends and developments in the lines of their special interests, so leaders in every field of business and professional activity study each issue of the business periodicals in their own fields.

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CLEAR-O-MATIC*

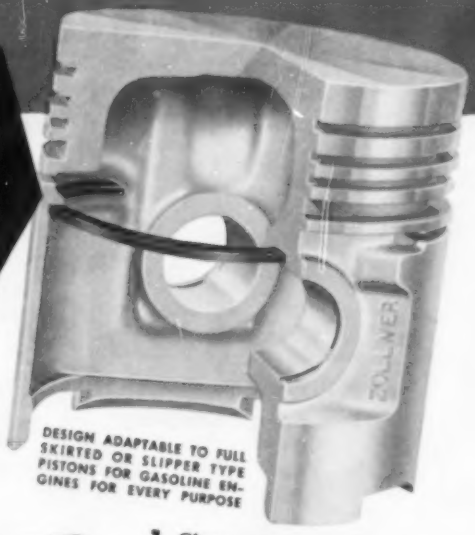
The All-Temperature Piston

UNIFORM SKIRT CLEARANCE FROM 20° BELOW ZERO TO 200° F

STEEL TENSION MEMBER

Anchored only at pin bosses and cast in positive contact with I.D. of piston skirt

Controls Clearance Automatically



DESIGN ADAPTABLE TO FULL SKIRTED OR SLIPPER TYPE PISTONS FOR GASOLINE ENGINES FOR EVERY PURPOSE

Sensational Performance

Requires less than .001 Clearance

Cold or Hot, Clear-O-Matic Piston clearance stays constantly uniform. Required clearance is reduced to less than .001. This great development of the "All-Temperature" Piston by Zollner engineers provides another fine feature attraction for the modern motor car . . . smooth, quiet running engine . . . no cold slap . . . reduced friction without loss of durability or heat conductivity . . . no danger of scuffing or seizing. We suggest a test of these sensational performance advantages for your engine.

UNIFORM EFFECTIVE SKIRT CLEARANCE AT ALL TEMPERATURES

1. Clearance maintained uniformly at all coolant temperatures from 20° below zero to 200° F.
2. Effective expansion identical with ferrous cylinder.
3. Steel tension member, with same effective expansion as cylinder, maintains uniform skirt clearance through entire temperature range.
4. Normal diametric clearance usually less than .001 with uniform skirt bearing.
5. Durability and conductivity comparable to heavy duty design.

*T.M. Reg. Pat. App. For

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PRECISION PRODUCTION

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THE ORIGINAL EQUIPMENT PISTONS

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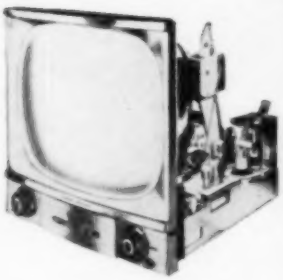


Admiral

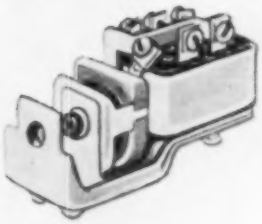
Placed at strategic spots throughout the chassis, EVERLOCK lockwashers keep Admiral TV sets tight—permanently.

Everlock®

MASTER TAMPER

8650 jolts per minute, hour after hour, can't shake loose the EVERLOCK lockwashers on the Master Tamper.

Everlock®



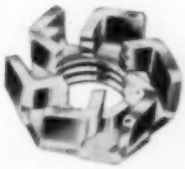
R-B-M SWITCHES

Specially designed EVERLOCK lockwashers provide permanent, vibration-proof fastenings on R-B-M automotive foot dimmer, headlamp and horn switches.

Everlock®... In the Picture

Wherever Positive Grip Counts

Lockwashers



Locknuts

Screw-Lockwasher Assembly

EVERLOCK lockwashers' exclusive alternating chisel edges bite into the face of the work *and* the nut under powerful spring tension . . . hold fast even under the most severe jars, jolts and vibration. Available in four standard types or to your own specifications, EVERLOCK lockwashers provide the positive holding power demanded by more and more manufacturers of quality products. Next time you order lockwashers be sure to specify AMF EVERLOCK.

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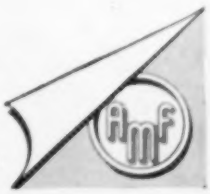
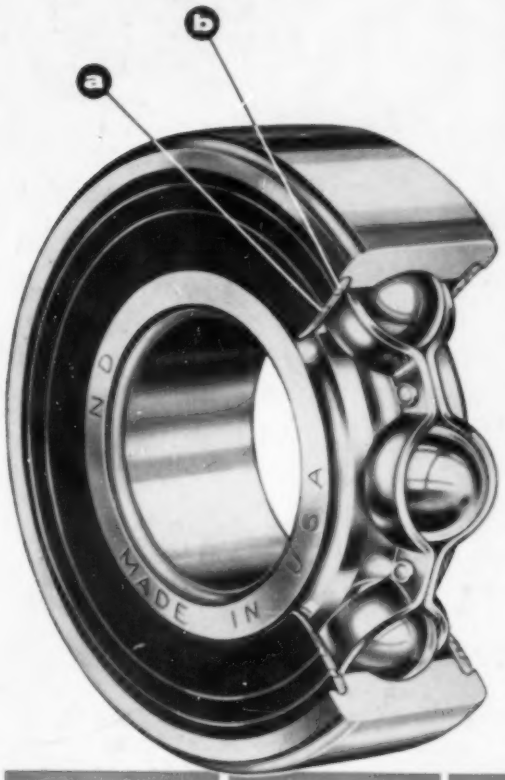


FACTS

about

NEW DEPARTURE
BALL BEARINGS



New Sentri-Seal...on guard against dirt and wear!

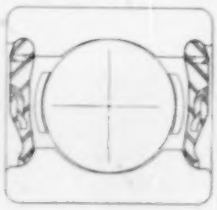
The unique design of the Sentri-Seal gives optimum protection against dirt, and includes a number of other major advantages.

Sentri-Seals are quickly removed, easily replaced. As the seal is of synthetic rubber, in which two metal rings are embedded, a constant-rate spring is created between the rings. Inherent flexibility prevents distortion of the bearing outer ring due to seal insertion, permitting the use of bearings to the higher accuracy specifications. The spring action maintains an efficient sealing contact with the bearing ring to bar dirt and retain lubricant. Sentri-Seals are relatively inert to oils and greases and operate satisfactorily through a temperature range of −40°F to 225°F. Specifications available for still higher temperatures. In applications where relubrication is desired, it is easily accomplished by the injection method.

The New Departure Sentri-Seal basically consists of two separate metal rings, "A" and "B", embedded in synthetic rubber, resulting in a spring which absorbs distortion and deflection. The seal is not drastically influenced by axial displacement due to bearing end-play within prescribed tolerances, and provides efficient sealing at low torque. Bearing shown is equipped with two seals.

The diagram shows in section the New Departure Sentri-Seal. Lip contacting surfaces are form-ground simultaneously with the ball race, giving an extremely high degree of concentricity between sealing surfaces and the raceway.

Sentri-Seal is available for a range of sizes in single-row, standard-width bearings and also in two types of New Departure adapter bearings. Sizes, dimensions and capacities are listed in the latest New Departure catalog.



Write for full details on Sentri-Seal

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